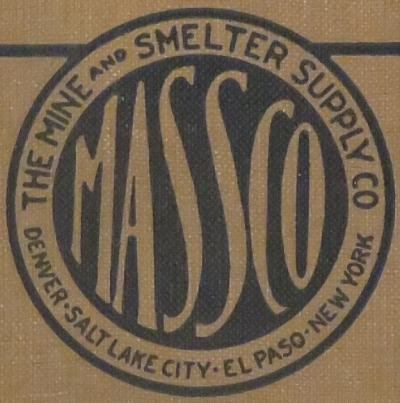
The Mine and Smelter Supply Company

ASSAYERS AND CHEMISTS SUPPLIES SCIENTIFIC INSTRUMENTS

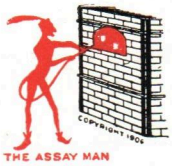


DENVER · SALT LAKE CITY
EL PASO · NEW YORK

CATALOG No. 54

H. E. Rodeher

CATALOG No. 54



Assayers' and Chemists' Supplies Laboratory Equipment for Schools and Colleges, Scientific Apparatus and Instruments

THE MINE AND SMELTER SUPPLY COMPANY

MASSCO **SERVICE**

SALT LAKE CITY, UTAH
DENVER COLORADO
EL PASO, TEXAS

GENERAL OFFICES NEW YORK CITY

Cable Address for General Offices and U. S. A. Branches: "MINTERPLY"

INTRODUCTION

HAND BOOK OF ASSAYERS' AND CHEMISTS' SUPPLIES.

This catalogue is presented to the Assay and Chemical Trade to serve as a Buyer's Guide in a very complex line. It is a new edition and in no sense a revision of an old catalogue. It has been our constant endeavor to arrange it logically and consistently and to facilitate quick reference; we have been lavish in illustrations which are accurately described.

To give it additional value and gain its more frequent use we have included much useful information and many reference tables, which our patrons will find of service, we feel sure.

Through our facilities and geographical locations, we are exceptionally fitted to give prompt service and make quick deliveries. We have large stocks at Denver, Salt Lake City and El Paso, the main office being in New York City. We especially solicit school and college trade and import their orders duty free.

We take this occasion to thank our patrons of many years acquaintance, and to express our hope that this book and modern business methods will gain new friends and customers among the users of Scientific Material.

Our experience is freely at the command of our patrons and requests for information will be given prompt and careful attention.

THE MINE & SMELTER SUPPLY CO.

Date.....

GENERAL INFORMATION

TERMS

Prices in this catalogue supersede all former prices, but are necessarily subject to change without notice, as market fluctuates.

Orders from parties unknown to us should be accompanied by cash or satisfactory references.

Goods will be sent C. O. D. if requested, but only if remittance is made sufficient to cover transportation charges both ways.

Sight Draft attached to Bill of Lading on all orders for Cyanide, Mercury, Zinc Shavings, Gold and Platinum.

QUOTATIONS.

Quotations are subject to change without notice, and when made from stock are subject to sale of quoted goods on intervening orders.

DELIVERY.

Sales and delivery are subject to strikes, accidents, or other causes beyond our control.

SHIPPING.

Unless definite shipping instructions are given, we will use our own judgment, forwarding by cheapest or quickest route.

MAILING.

Acids, explosives, gasoline and other highly inflammable substances are prohibited from the mails. It is not advisable to mail fragile or delicate articles, owing to the risk of breakage.

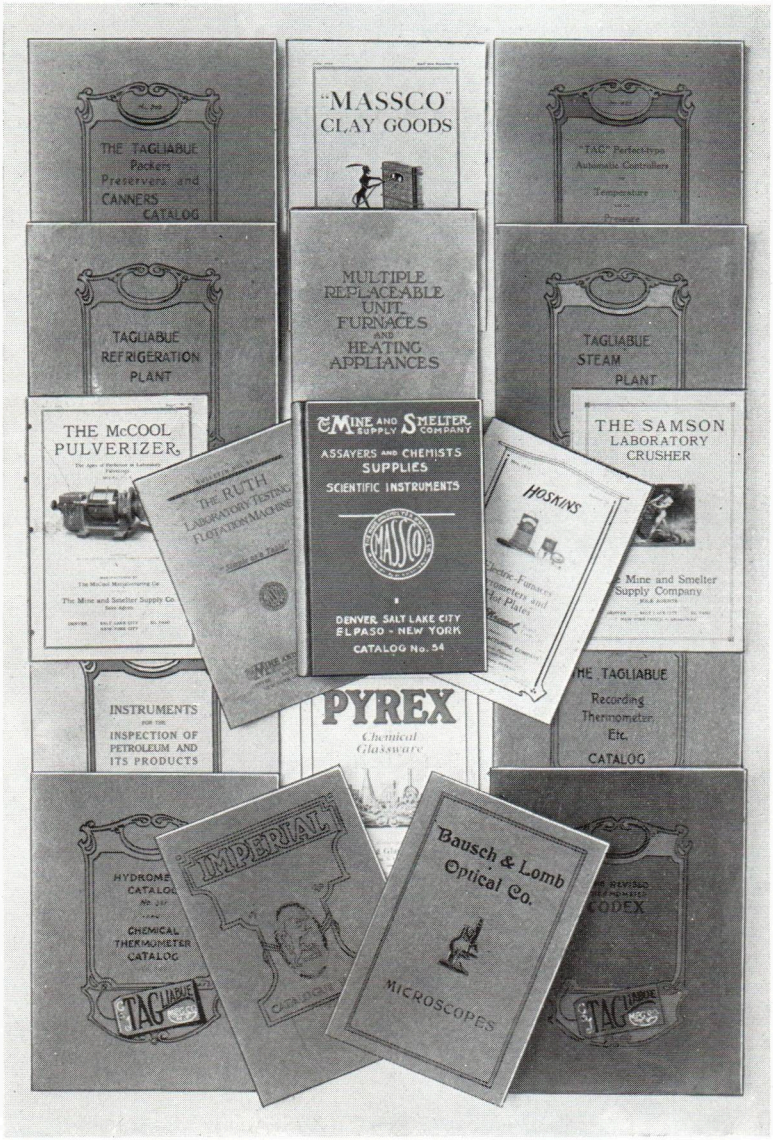
PACKING.

All goods are packed with the greatest care by experienced packers, and every precaution is taken to prevent breakage in transit. We cannot, however, assume responsibility for safe transportation. Our liability ceases when goods are receipted for in good condition by the carrier.

EXPORT ORDERS.

We solicit Export Orders, being thoroughly familiar with all customs regulations. Our long experience in this business enables us to prepare the necessary documents accurately, insuring our customers the quickest possible service.

ILLUSTRATIONS OF CATALOGUES



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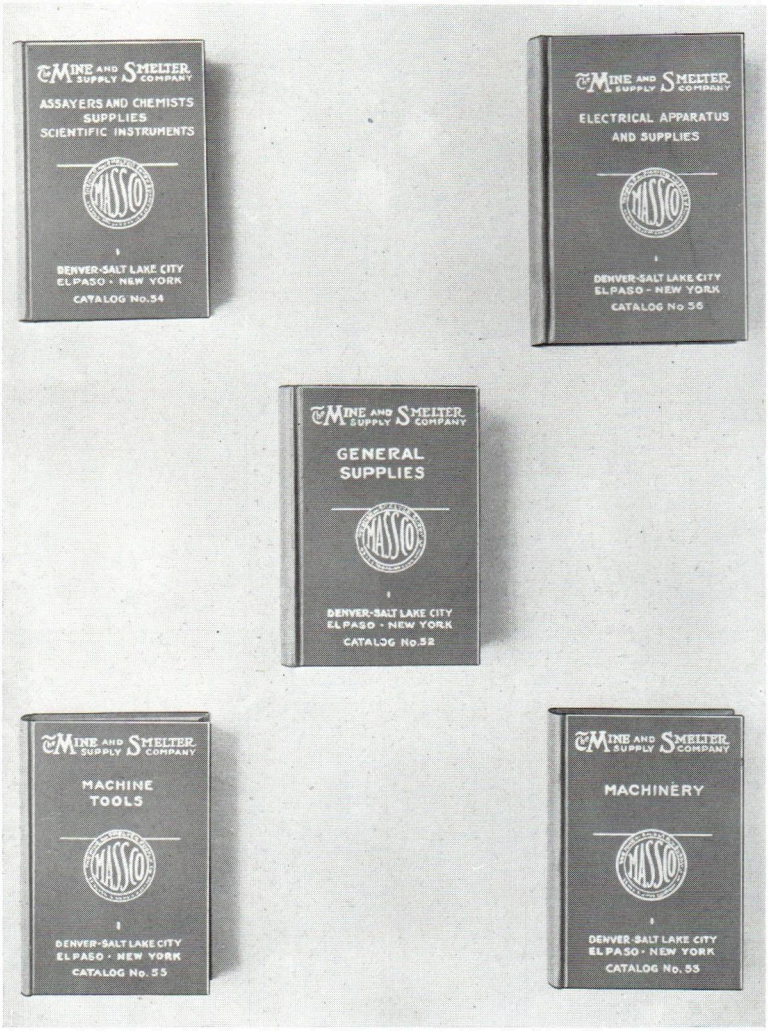
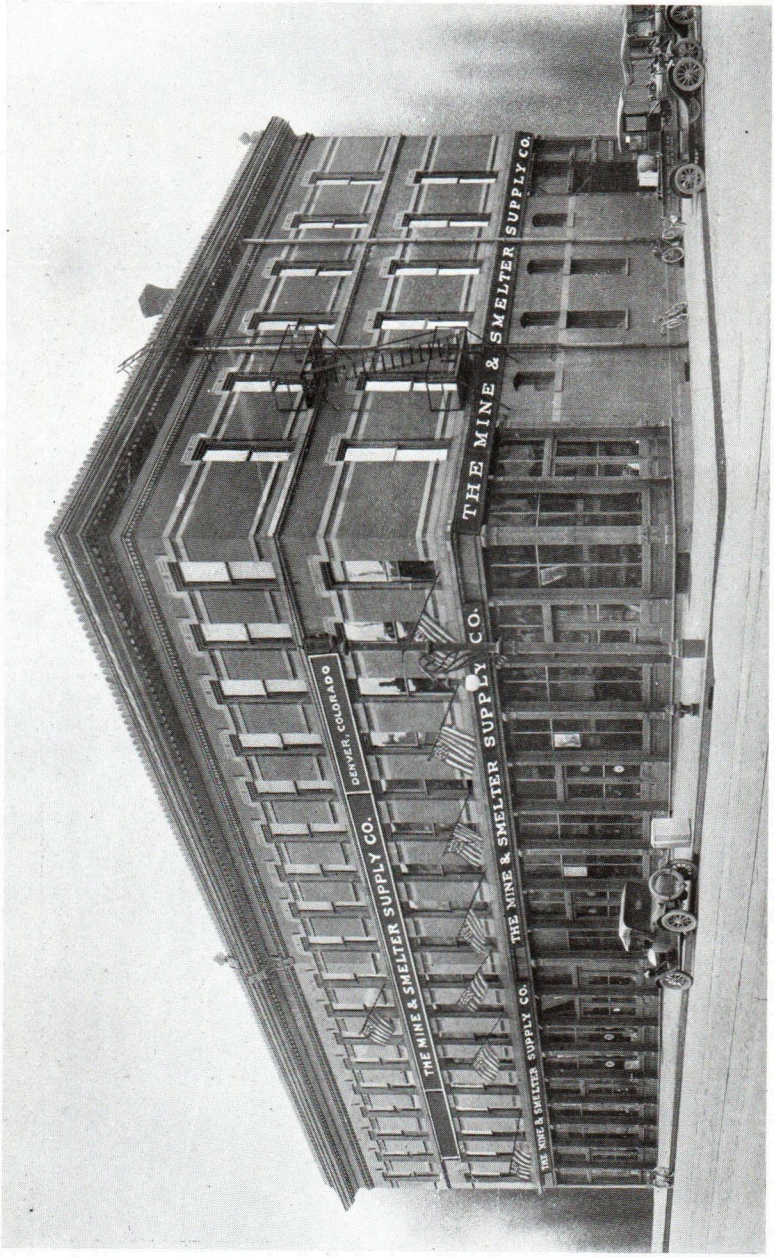
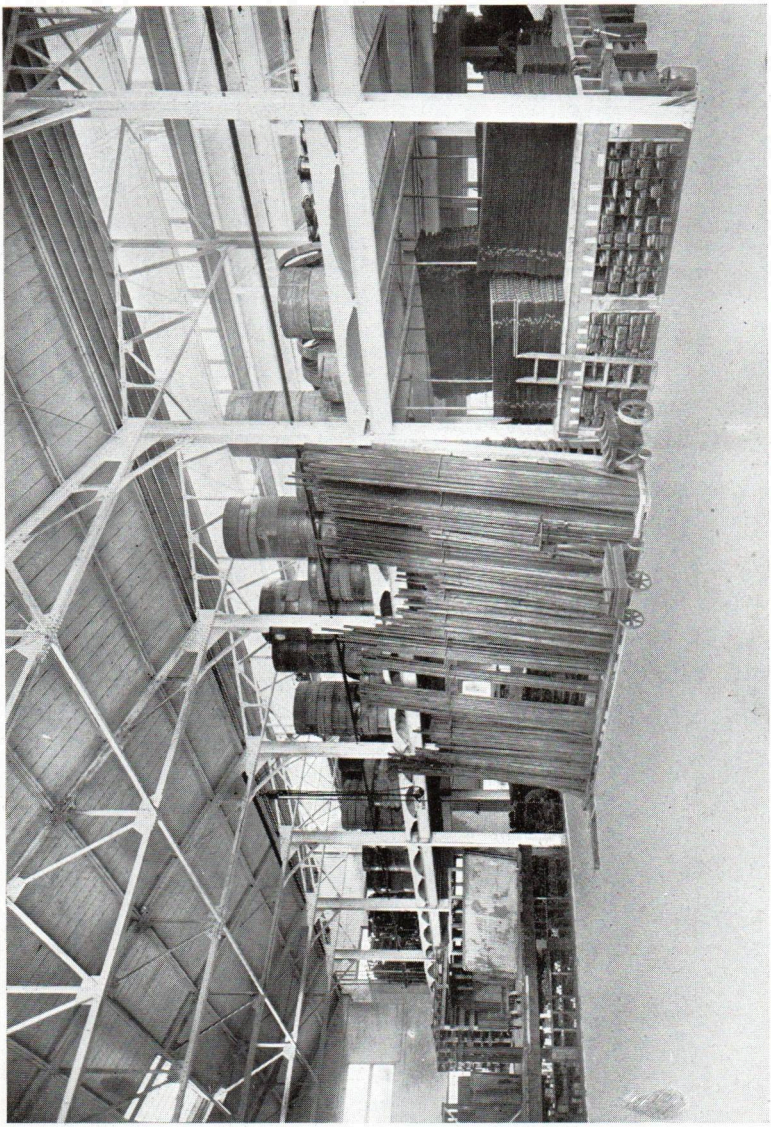


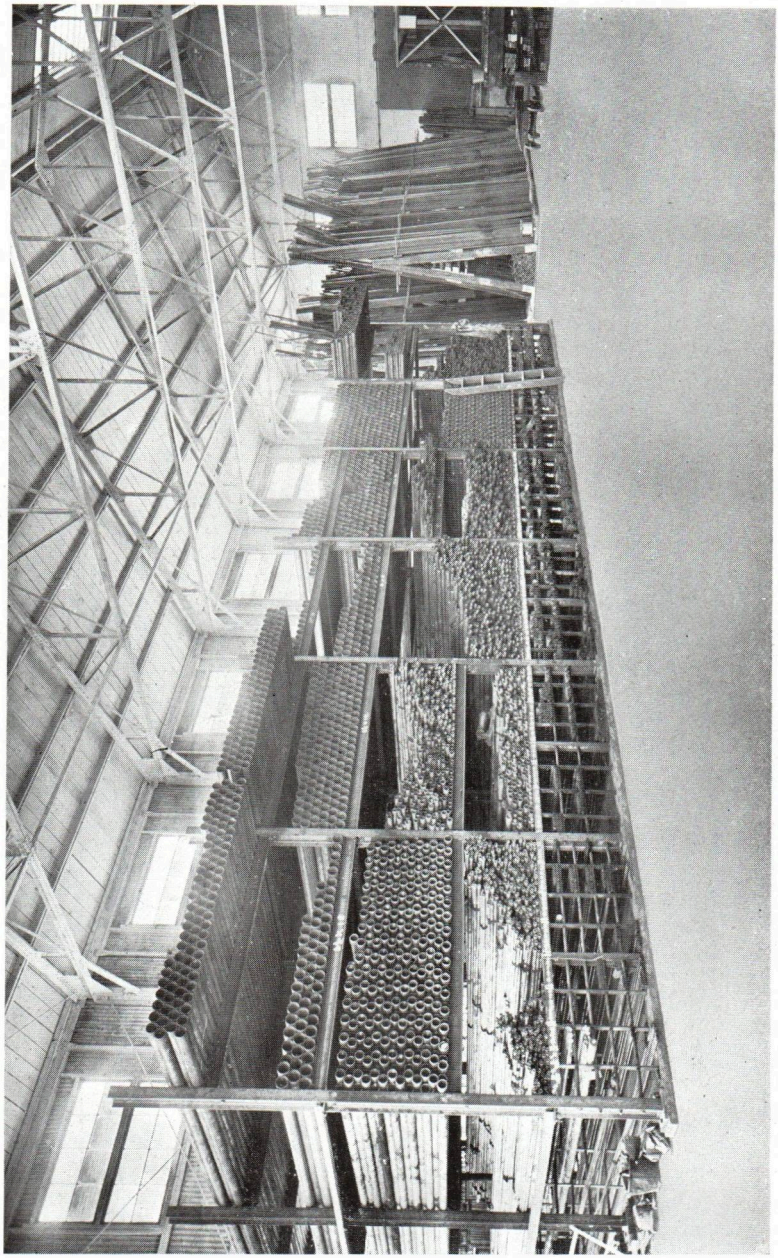


Corner 17th and Blake Sts., Denver, Colorado.

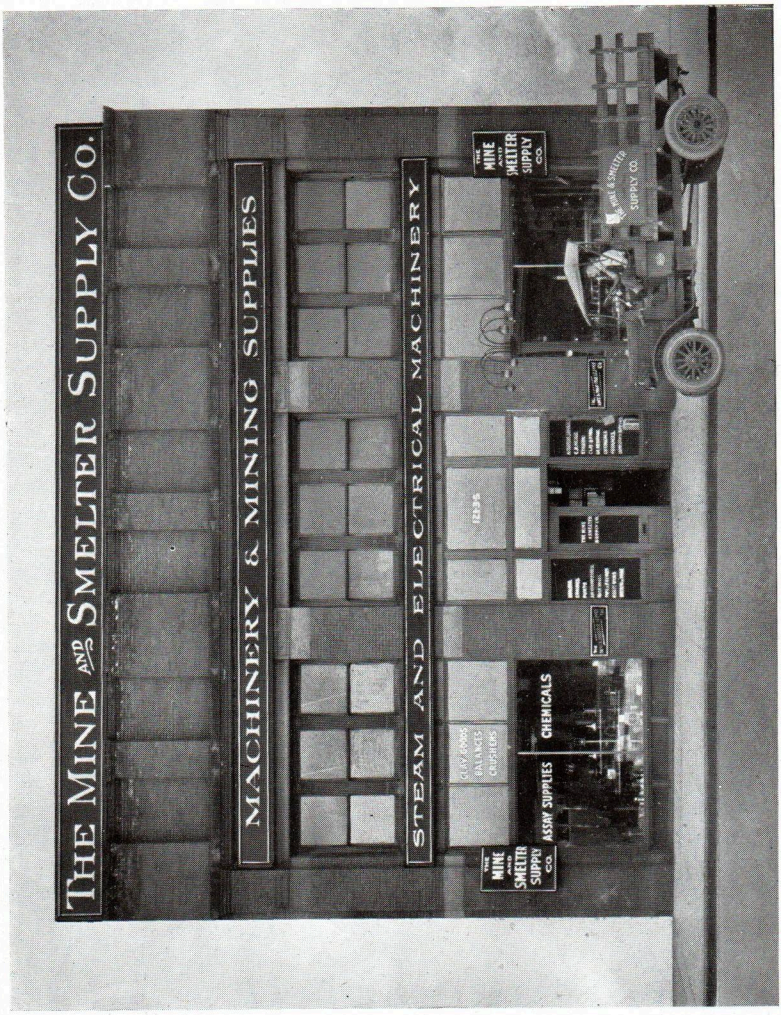
Warehouses at Denver, Colo.



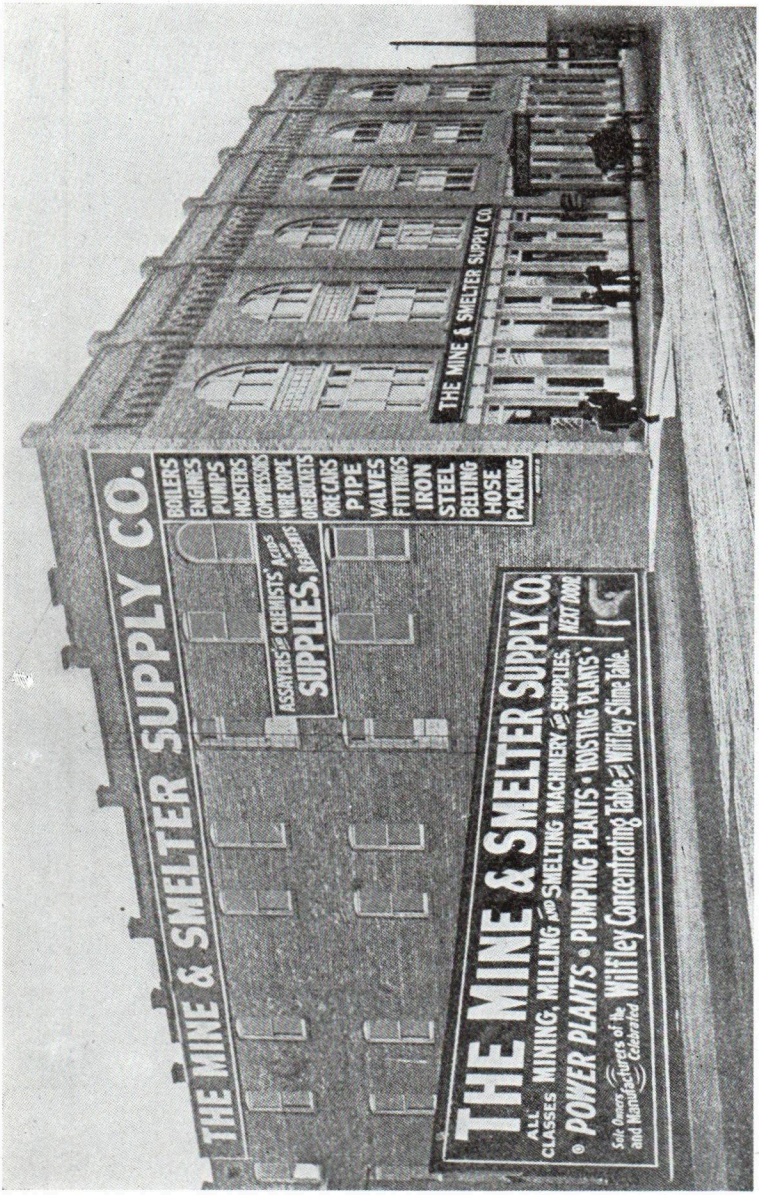
An Interior View in Our Warehouses.



Pipe, Boiler Tubes, Bars, Shafting, Etc.



121-123-125 West Second South Street, Salt Lake City, Utah.



San Francisco Street, El Paso, Texas.

DOMESTIC PARCEL POST RATES

(IN EFFECT MARCH 15, 1918)

Weight Pounds	First Zone Local Rate	First Zone Zone Rate 50 Miles	2d Zone 50 to 150 Miles Rate	3d Zone 150 to 300 Miles Rate	4th Zone 300 to 600 Miles Rate	5th Zone 600 to 1000 Miles Rate	6th Zone 1000 to 1400 Miles Rate	7th Zone 1400 to 1800 Miles Rate	8th Zone All Over 1800 Miles Rate
1	.05	.05	.05	.06	.07	.08	.09	.11	.12
2	.06	.06	.06	.08	.11	.14	.17	.21	.24
3	.06	.07	.07	.10	.15	.20	.25	.31	.36
4	07	.08	.08	.12	.19	.26	.33	.41	.48
5	.07	.09	.09	.14	.23	.32	.41	.51	.60
6	.08	.10	.10	.16	.27	.38	.49	.61	.72
7	.08	.11	.11	.18	.31	.44	.57	.71	.84
8	.09	.12	.12	.20	.35	.50	.65	.81	.96
9	.09	.13	.13	.22	.39	.56	.73	.91	1.08
10	.10	.14	.14	.24	.43	.62	.81	1.01	1.20
11	.10	.15	.15	.26	.47	.68	.89	1.11	1.32
12	.11	.16	.16	.28	.51	.74	.97	1.21	1.44
13	.11	.17	.17	.30	.55	.80	1.05	1.31	1.56
14	.12	.18	.18	.32	.59	.86	1.13	1.41	1.68
15	.12	.19	.19	.34	.63	.92	1.21	1.51	1.80
16	.13	.20	.20	.36	.67	.98	1.29	1.61	1.92
17	.13	.21	.21	.38	.71	1.04	1.37	1.71	2.04
18	.14	.22	.22	.40	.75	1.10	1.45	1.81	2.16
19	.14	.23	.23	.42	.79	1.16	1.53	1.91	2.28
20	.15	.24	.24	.44	.83	1.22	1.61	2.01	2.40
21	.15	.25	.25	.46	.87	1.28	1.69	2.11	2.52
22	.16	.26	.26	.48	.91	1.34	1.77	2.21	2.64
23	.16	.27	.27	.50	.95	1.40	1.85	2.31	2.76
24	.17	.28	.28	.52	.99	1.46	1.93	2.41	2.88
25	.17	.29	.29	.54	1.03	1.52	2.01	2.51	3.00
26	.18	.30	.30	.56	1.07	1.58	2.09	2.61	3.12
27	.18	.31	.31	.58	1.11	1.64	2.17	2.71	3.24
28	.19	.32	.32	.60	1.15	1.70	2.25	2.81	3.36
29	.19	.33	.33	.62	1.19	1.76	2.33	2.91	3.48
30	.20	.34	.34	.64	1.23	1.82	2.41	3.01	3.60
31	.20	.35	.35	.66	1.27	1.88	2.49	3.11	3.72
32	.21	.36	.36	.68	1.31	1.94	2.57	3.21	3.84
33	.21	.37	.37	.70	1.35	2.00	2.65	3.31	3.96
34	.22	.38	.38	.72	1.39	2.06	2.73	3.41	4.08
35	.22	.39	.39	.74	1.43	2.12	2.81	3.51	4.20
36	.23	.40	.40	.76	1.47	2.18	2.89	3.61	4.32
37	.23	.41	.41	.78	1.51	2.24	2.97	3.71	4.44
38	.24	.42	.42	.80	1.55	2.30	3.05	3.81	4.56
39	.24	43	.43	.82	1.59	2.36	3.13	3.91	4.68
40	.25	.44	.44	.84	1.63	2.42	3.21	4.01	4.80
41	.25	.45	.45	.86	1.67	2.48	3.29	4.11	4.92
42	.26	.46	.46	.88	1.71	2.54	3.37	4.21	5.04
43	.26	.47	.47	.90	1.75	2.60	3.45	4.31	5.16
44	.27	.48	.48	.92	1.79	2.66	3.53	4.41	5.28
45	.27	.49	.49	.94	1.83	2.72	3.61	4.51	5.40
46	.28	.50	.50	.96	1.87	2.78	3.69	4.61	5.52
47	.28	.51	.51	.98	1.91	2.84	3.77	4.71	5.64
48	.29	.52	.52	1.00	1.95	2.90	3.85	4.81	5.76
49	.29	.53	.53	1.02	1.99	2.96	3.93	4.91	5.88
50	30	54	.54	1.04	2.03	3.02	4.01	5.01	6.00
51	.30	.55	.55	1.06					
52	31	.56	.56	1.08					
53	.31	.57	.57	1.10					
54	32	.58	.58	1.12					
55	.32	.59	.59	1.14					
56	.33	.60	.60	1.16					
57	.33	.61	61	1.18					
58	.34	.62	.62	1.20					
59	34	.63	.63	1.22					
60	.35	.64	.64	1.24					
61	.35	.65	.65	1.26					
62	36	.66	.66	1.28					
63	.36	.67	.67	1.30					
64	.37	.68	.68	1.32					
65	.37	.69	.69	1.34					
66	.38	.70	.70	1.36					
67	.38	.71	.71	1.38					
68	.39	.72	.72	1.40					
69	.39	.73	.73	1.42					
70	.40	.74	.74	1.44					
	...	..	...	....					

Parcels weighing 4 ounces or less, except books, seeds, plants, etc., 1 cent for each ounce or fraction thereof, any distance.

Parcels weighing 8 ounces or less, containing books, seeds, cuttings, bulbs, roots, scions and plants, 1 cent for each 2 ounces or fraction thereof, regardless of distance.

Parcels weighing more than 8 ounces, containing books, seeds, plants, etc., parcels of miscellaneous printed matter weighing more than 4 pounds and all other parcels of fourth-class matter weighing more than 4 ounces are chargeable, according to distance or zone, at the pound rates shown in the above table, a fraction of a pound being considered a full pound.

The Limit of Weight of fourth-class matter is 70 pounds for parcels mailed for delivery within the first, second and third zones, and 50 pounds for all other zones.

Limit of Size. Parcel post matter may not exceed 84 inches in length and girth combined. In measuring a parcel the greatest distance in a straight line between the ends (but not around the parcel) is taken as its length, while the distance around the parcel at its thickest part is taken as its girth. For example, a parcel 35 inches long, 10 inches wide and 5 inches high measures 65 inches in length and girth combined.

PARCEL POST INFORMATION

The act of Congress authorizing the establishment of a parcel post system provides that on and after January 1, 1913, fourth class mail matter shall embrace all other matter, including farm and factory products, not now embraced by law in either the first, second or third class, not exceeding 20 pounds in weight except when for the first or second zones, where the maximum weight mailable is increased to 50 pounds. Packages must not be in form nor kind likely to injure the person of any postal employe or damage the mail equipment or other mail matter, and not of a character perishable within a period reasonably required for transportation and delivery. Parcels must not exceed 72 inches in length and girth combined.

SPECIAL DELIVERY SERVICE.

A mailable parcel will be accorded the usual special delivery service when a special delivery stamp or 10 cents in ordinary stamps are affixed thereto in addition to the postage. When ordinary stamps are used the words "special delivery" must be placed on the wrapper.

INSURANCE ON PARCELS.

A mailable parcel on which the postage is fully prepaid may be insured (it cannot be registered) against loss in an amount equivalent to its actual value, but not to exceed $25.00, on payment of a fee of 5 cents in parcel post stamps and in an amount equivalent to its actual value in excess of $25.00, but not to exceed $50.00, on payment of a fee of 10 cents in stamps, such stamps to be affixed. The amount of the insurance fee shall be placed on the receipt given the sender and on the coupon retained at the mailing office.

C. O. D.

The sender of a mailable parcel on which the postage is fully prepaid may have the price of the article and the charges thereon collected from the addressee on payment of a fee of 10 cents in ordinary postage stamps affixed, provided the amount to be collected does not exceed $100.00. Such a parcel will be insured against loss, without additional charge, in an amount equivalent to its actual value, but not to exceed $50.00.

The sender of a collect on delivery (C. O. D.) parcel will be given a receipt showing the office and date of mailing, the number of the parcel and the amount due him.

A C. O. D. parcel will be accepted for mailing only at a money order office and when addressed to a money order office. Money order offices are designated in the parcel post guide by an asterisk (*) or a dagger (†). The postmaster at the mailing office will be held responsible for the postage required for the return of a parcel addressed to a non-money order office.

TELEGRAPH CODE

QUOTATIONS, ORDERS AND SHIPMENTS FOR DEALERS

BEG.....We will ship immediately.
BEGGAR.....We will try to ship.
BEGRUDGE....We expect to ship
BEHAVE.....We shipped your order.
BEHEAD.....We will trace.
BEHEST.....We have no order.
BEHOLD.....We have ready for shipment.
BELAY.....We are holding the order for ——, shall we ship balance without them?
BEMOAN.....We have suspended work on your order
BENEFIT.....We have canceled your order.
BENGAL.....Order is being executed and cannot be cancelled.
BENUMB..... Your letter was not received in time.
BEQUEST.....Your telegram was not received in time.
BESET.....Your telegram was unintelligible. Please repeat.
BESOUGHT....We quote you.
BESTOW.....We will accept order.
BETIDE.....We can not accept order.
BETOKEN.....We will hold offer open.
BETRAY.....We can not hold offer open.
BETROTH....We hereby withdraw all quotations.
BEWAIL.....The price of —— is to-day advanced to ——.
BEWITCH....Please specify quantity wanted.
BIGNESS....Please specify sizes and quantity wanted.
BIGOT...Please send shipping instructions.
BILLIARDS..See our letter of ——.
BIPED..See our telegram of ——.
BIRTH Telegraph to-morrow.
BISCUIT..Please reply immediately by telegraph.
BISHOP.....Answer by wire at our expense.
BISMUTH...Must have answer by ——.
BISON.....Will send particulars by mail.
BLAB.....Please answer our letter of the ——.
BLACKING.Please answer our telegram of the ——.

PHRASES

BLAME.....If ordered immediately.
BLAMELESS...If ordered immediately by wire.
BLANCH.....For immediate acceptance.
BLANKET.....For immediate acceptance and shipment.
BLARNEY.....For acceptance within ——.
BLAST.....Less freight allowance per 100 pounds of ——.
BLEED.....Referring to your letter of ——.
BLEMISH.....Referring to your telegram of ——.
BLENDING....In reply to your favor of the ——.
BLESS.....Your order of the ——.
BLESSING.....Our order of the ——.
BLIGHT.....Your order for ——.
BLISSFUL.....Our order for ——.
BLISTER.....In addition to previous order.
BLOAT.....In less than ——.
BLOODY.....Not less than ——.
BLOTCH.....No sooner than ——.
BLOUSE.....Not later than ——.
BLOW.....During this week.
BLUBBER.....Last of this week.
BLUFF.....During next week.
BLUNDER.....Early next week.
BLUNT.....About middle of next week.
BOARD.....Last of next week.
BOAST.....First week in ——.
BOAT.....Second week in ——.
BOBBIN.....Third week in ——.
BOLD.....Last week in ——.
BOLSTER.....Within the next ——.
BOMBARD.....Within a few days.
BOMBAST.....Within one week.
BOMBAY.....Within ten days.
BONDMAN.....Within two weeks.
BONNET.....Within three weeks.
BORROW.....Within four weeks.
BOSOM.....Within a reasonable time.
BOTANY.....Per foot net.
BOUNCE.....Per foot less ——.
BOUND.....Per 100 feet net.
BOUNTY.....Per 100 feet less ——.
BOWLDER.....Per pound net.
BOWLING.....Per pound less ——.
BRACKET.....Per 100 pounds net.
BRAG.....Per 100 pounds less ——.
BRAIN.....Per dozen net.
BRANCH.....Per dozen less ——.
BRAMBLE.....Per 100 net.
BRAVADO.....Per 100 less.

TELEGRAPH CODE

ORDERS, FREIGHT AND ROUTING

Haba.....Are you making any shipments for us,
Habe.....Are you making the following shipments.....?
Habo.....By what route did you ship?
Habs.....Shipment made by.....
Habt.....Can arrange for immediate shipment.
Habu.....Can make no shipment until.....
Haca.....Can you arrange for immediate shipment?
Hack.....Have on hand for immediate shipment.
Haco.....Have you on hand for immediate shipment?
Hact.....Can we substitute.....in place of your order for ..... as we are entirely out of what you ordered?
Hacu.....Substitute.....in place of.....
Hada.....Car number.
Hade.....Carload lots.
Hado.....Consigned.....care of.....
Hads.....Freight allowance of.....
Haeb.....Freight allowance not to exceed.....
Haek.....Approximate freight rate is.....
Haet.....Freight rates are advancing.
Haeu.....Hold for future instructions.
Haev.....In same car.
Hafe.....In less than carload lots.
Hafi.....Must be shipped.
Hafo.....Route goods on order.....by way of.....
Hafs.....Send tracer for shipment(s).
Haft.....Shall we ship.....?
Hafu.....Ship by express.
Haga.....Shiy by express charges collect.
Hage.....Ship by Express C. O. D.
Hagm.....Ship by fast freight.
Hago.....Shiy by fast freight to.....
Hags.....Too late to stop shipment, which has been (was) made.
Hahm.....Trace by wire, shipments.....
Hahn.....Unload cars at our expense.
Haht.....Wire initials and car number.
Hahu.....Wire initials and number of cars, route and date of shipment.
Haif.....Add to order.
Haik.....Add to order of this date.....
Hain.....All orders for.....have been filled.....
Haix.....Can you duplicate.....order (s).....
Haja.....Correct order (s) to read.....
Haje.....Duplicate.....and order (s).....
Haka.....See your order (s).....and wire us whether item is correctly specified.
Hako.....See your order (s).....we are holding for instructions.
Hakt.....Shall we cancel order?
Hala.....Shall we ship what we have already, and let balance follow?
Halb.....Ship all you can.
Hald.....Ship as soon as possible.
Hale.....Ship today surely.
Haln.....Ship what you can and let balance follow.
Hals.....Ship with our order of.....
Hamb.....Too late to cancel order (s).
Hame.....We are unable to ship.....on account of.....
Hamp.....Will ship balance due on order (s).....and complete.
Hamu.....Will ship from stock.
Hani.....Will ship within or by.....
Hanp.....Why do you not ship our order?

FREIGHT CLAIMS

All goods are packed by skilled men. If an article is broken in transit, the condition of the package at its destination is no evidence of its original condition. We cannot be responsible for loss or damage after we take the transportation company's receipt. If goods arrive at destination damaged or in bad order, consignee should see that receipt is given accordingly, so that recourse may be had on the transportation company. We will however assist our customers in collecting claims wherever possible.

HOW TO MAKE FREIGHT CLAIMS

The following valuable information, compiled by a competent railroad authority will be of assistance in filing claims:

The policy of all railroad companies is to establish the validity of every claim filed and not to avoid liability, and the honest, frank and hearty co-operation on the part of all concerned in presenting claims with the evidence desired does much to expedite settlement.

Some suggestions are offered relative to the preparation of claims, which dealers will do well to observe. If the claim is for loss or damage the following documents should be submitted in support of the claim:

Original bill of lading.

Original paid freight bill.

Original invoice or attest copy.

Statement of claimant showing how the amount of loss or damage has been determined, with all the evidence he can possibly secure or that may be necessary to substantiate same.

Bill for cost of repairs, account sales, or such other document as will verify amount claimed.

When the claim is for overcharge the bill of lading, freight bill and evidence of the weight of the shipment should be submitted; also a statement showing how the claimant has determined the amount of the overcharge with definite authority for the rate claimed.

If any of the documents are missing their absence should be explained and if it is impossible to supply the original bill of lading or freight bill, claimant should indemnify the carrier against loss in the payment of duplicate claims supported by the original documents.

Any loss or damage should be reported to the agent of the delivering line immediately on discovery and every opportunity should be afforded him to inspect and verify same and in no case should report of this loss or damage be delayed beyond twenty-four hours after receipt.

Delays in completing investigation are sometimes unavoidable on account of the numerous agencies involved. It must be borne in mind that every claim must undergo some investigation, since reports of loss or damage are not always at the finger tips of the claim department.

Delays in adjusting claims for damages often come about through the refusal of the consignee to accept property which has been delayed or damaged in transit. It should be understood that the acceptance of such delayed or damaged property does not in any way jeopardize any proper claim which the owner may have against the carrier. In fact, the law expressly provides that consignee must accept his own property and use all diligence in disposing of it with a view of minimizing the loss.

The "acknowledgment receipt" of a claim is through the medium of a postal card bearing claim number under which all correspondence pertaining to that claim is handled, and it would expedite the work to no little extent if reference is made to the claim number in any correspondence from the claimants or on statements of acounts subsequently referred.

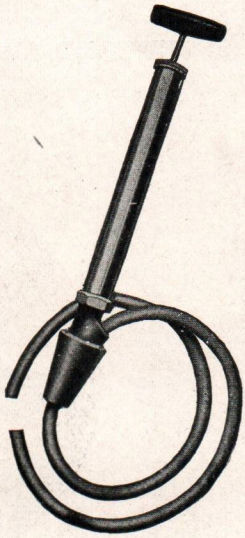
SPECIAL NOTICE

THE PRICES OFFERED IN THIS CATALOGUE ARE BASED ON THE COST OF OUR PRESENT STOCK OF GOODS; OR IN CASE THE GOODS ARE NOT STOCKED REGULARLY, UPON THE PRESENT WHOLESALE PRICE.

DUE TO THE CONSTANTLY VARYING CONDITIONS THESE PRICES ARE

SUBJECT TO CHANGE WITHOUT NOTICE.

IMPORTANT



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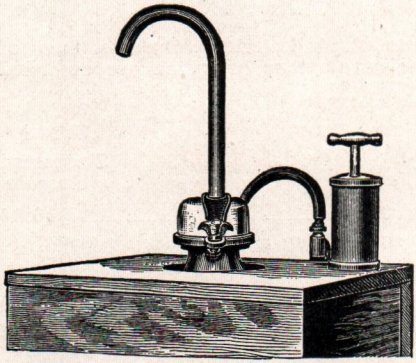
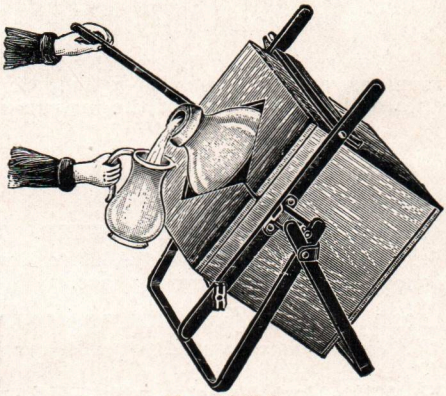


No. 4001B



No. 4001C

4001A **ACID PUMP.** Improved form, simple and effective, each.....$10.00

4001B **ACID PUMP.** For drawing acids or other liquids from carboys, very substantial and effective, for laboratory use, each..... 8.50

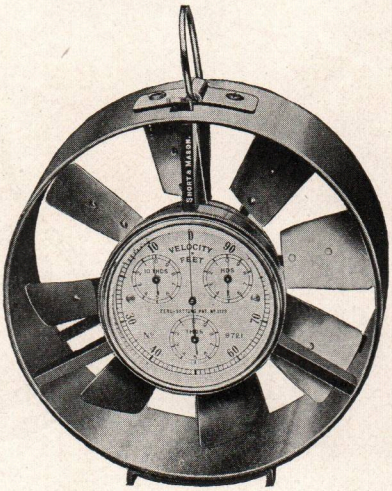
4001C **ACID CARBOY ROCKER.** This support entirely prevents spilling, and the consequent danger, when carrying or tilting carboys. By this means they can be carried with ease, and any quantity drawn with safety, each..... 7.50

4001D **ACID PITCHERS.** Stoneware, with handle.

Capacity .....pts.	1	2	4	8	16
Each	$0.25	$0.35	$0.50	$0.85	$1.25

Tycos JEWELED AIRMETERS

No. 4002A



No. 4002B

For registering the velocity of currents of air in mines, tunnels, flues of furnaces, etc., by means of a light fan, the revolutions of which are recorded on a dial in the centre of the instrument.

Suggested resale

4002A **S. & M. *Tycos* AIRMETER.** Type 3112 ..... $40.00

With dials reading to 100,000 feet, with zero-setting attachment. Weight 8½ ounces. In leather carrying case.

4002B **S. & M. *Tycos* BIRAM'S ANEMOMETER.** Type 3130 ..... 33.00

Jeweled movement, fitted with our patented zero-setting attachment (patent No. 3729) 3-inch diameter, with 2 dials reading to 1000 feet, in sole-leather carrying case. Weight 8 ounces.

4002C **S. & M. *Tycos* BIRAM'S ANEMOMETER.** Type 3132 ..... 38.00

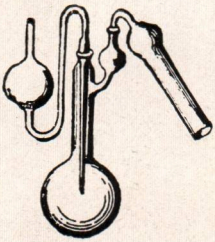
Same as Type 3130, except 4-inch diameter and 4 dials reading to 100,000 feet. Weight 16 ounces.

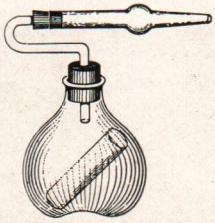
NOTE—Airmeters and Anemometers can be supplied with metric dials in place of feet at no extra charge.

Each instrument is tested and a chart of corrections supplied, but cannot be guaranteed correct when used in temperatures exceeding 300° Fahrenheit.

Two-dial instruments will stand pressure of 1,000 feet per minute; 4-dial instruments will stand pressure of 3,000 feet per minute.

ALKALIMETERS


No. 4003A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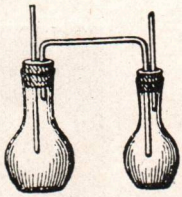
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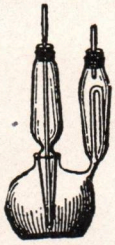
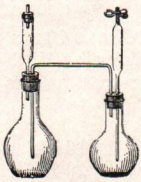

No. 4003D

4003A **ALKALIMETER,** Bunsen's rubber connections..... .....
4003B **ALKALIMETER,** Fresenius' ....
4003C **ALKALIMETER,** Fresenius' and Will's..... .....
4003D **ALKALIMETER,** Geissler's, with ground joints..... .....

No. 4003E

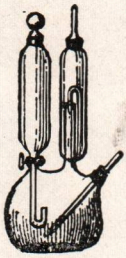
No. 4003F

No. 4003G

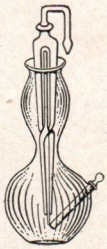

No. 4003H

4003E **ALKALIMETER,** Geissler's, with stopcock..... .....
4003F **ALKALIMETER,** Kipp's with stopcock..... .....
4003G **ALKALIMETER,** Mohr's with pinch cock..... .....
4003H **ALKALIMETER,** Mohr's, for carbonic acid determinations..... .....

No. 4003I


No. 4003J

No. 4003K

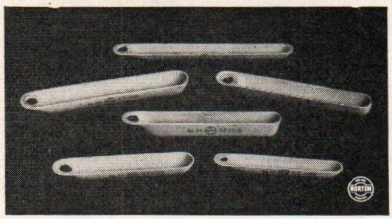

No. 4003L

4003I **ALKALIMETER,** Mohr's, with stopcock..... .....
4003J **ALKALIMETER,** Rohrbeck's, with stopcock..... .....
4003K **ALKALIMETER,** Schroedter's, with stopcock..... .....
4003L **ALKALIMETER,** Mohr's, latest improved form..... .....
Prices for above on application.

AMALGAM BUCKETS. See Buckets.
ANEROID BAROMETERS. See Barometers.

ALUNDUM WARE

ALUNDUM COMBUSTION BOATS



No. 4004A

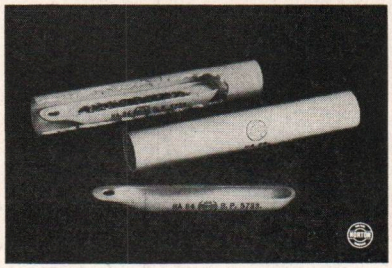
Alundum combustion boats are particularly well suited for the conditions met in the determination of carbon in iron and steel.

The well proportioned shapes, Type 3729 and Type 5358, have proved most desirable for this work. RR Alundum is recommended to protect the boats from the slagging effect of the iron oxide formed during the combustion of the sample.

Before using in quantitative work, the combustion boat should be ignited to remove the small amount of carbon in the ink of the trade mark and any dust which may have accumulated upon it. Otherwise a high result will be obtained.

These boats are also valuable for other kinds of determinations involving combustions at high temperatures and can be supplied in many sizes with a thin or thick wall as may be desired. The wall thickness of the standard sizes is $\frac{1}{16}''$.

	Type	Length	Width	Height	Price
4004A	5733	3 ½″	½″	$\frac{5}{16}''$	$0.30
4004B	3729	3 ¾″	⅝″	⅜″	.35
4004C	7711	4 ½″	⅝″	$\frac{7}{16}''$	.40
4004D	5358	5″	¾″	$\frac{7}{16}''$	.40
4004E	6016	5 ½″	½″	$\frac{5}{16}''$	.40



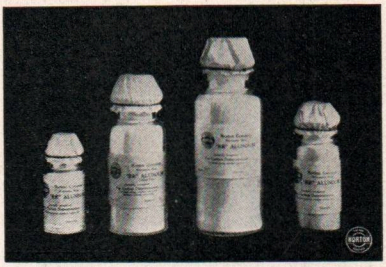
No. 4004F

For the protection of combustion tubes from the spattering of over-heated metals, these shields give excellent service. These are made of mixture RA 84.

	Type	Bore	Length	Wall	Out. Dia.	Price
4004F	6487	$\frac{11}{16}''$	4 ½″	$\frac{1}{32}''$	¾″	$3.00
4004G	12303	$\frac{13}{16}''$	5 ½″	$\frac{1}{32}''$	⅞″	3.00

ALUNDUM WARE

RR ALUNDUM
Crystalline Alumina



No. 4005A

4005A In preparing samples for the determination of carbon in steel, it has been found desirable to protect the combustion boat from the molten metal. This is best accomplished by spreading a layer of very pure electrically fused alumina on the bottom of the boat before introducing the sample of steel. This prevents a contact of the softened metal or oxides with the boat and materially prolongs its service.

RR Alundum (white label), as this pure fused alumina is designated, is prepared for this purpose.

1 lb. in glass stoppered bottles	$1.25
2 lbs. in glass stoppered bottles	1.75
5 lbs. in glass stoppered bottles	3.50
5-lb. can	2.50

RR Alundum (blue label) alumina is specially treated to remove carbonaceous matter and surface alkali. The purity of this grade is assured by quantitative analysis of a sample from each lot made. A very satisfactory blank determination for carbon is maintained.

1 lb. in glass stoppered bottles	$1.50
2 lbs. in glass stoppered bottles	2.25
5 lbs. in glass stoppered bottles	4.25

Both grades of this material are supplied in 46, 60, and 90 mesh grain. Sizes 60 and 90 are most commonly used.

REFRACTORY CEMENT

Alundum cements are superior to other mixtures for covering wire resistors in many kinds of high-temperature electrical apparatus and appliances.

In using any of these it is only necessary to mix the dry cement with sufficient water to make a plastic mass, apply in this condition, dry, and then burn at the highest temperature that can be obtained in the resistor.

REFRACTORY CEMENT RA 162

4005B For embedding alloy wires in the construction of small electric furnaces and similar appliances, the cement RA 162 is the most suitable mixture and has been found generally serviceable.

5-lb. bag	$0.25 per pound
10-lb. bag	.16 per pound
25-lb. bag or keg	.16 per pound
50-lb. keg	.12 per pound
300-lb. keg	.08 per pound
Ton lots	.075 per pound

ALUNDUM WARE

REFRACTORY CEMENT RA 355

No. 4006A

Kegs and Bags of Cement

4006A. A finer mixture that is desirable for some purposes, but with the same properties of the mixture RA 162, is the cement RA 355.

5-lb. bag	$0.32	per pound
10-lb. bag	.24	per pound
25-lb. bag or keg	.24	per pound
50-lb. keg	.18	per pound
300-lb. keg	.15	per pound
Ton lots	.13	per pound

Two other cements RA 562, of fine grain, and RA 563, which is of coarser material, are supplied for special constructions wherein it is desirable to use platinum as a resistor. These are used in the same way as are the other cements. The prices of RA 562 are the same as for the cement RA 305, and of RA 563 the same as for RA 355.

REFRACTORY CEMENTS RA 305, RA 518

4006B. A cement that matures at a temperature of about 500° C. is required for some purposes, and this is designated as RA 305.

5-lb. bag	$0.40	per pound
10-lb. bag	.30	per pound
25-lb. bag	.30	per pound
50-lb. bag or keg	.25	per pound
300-lb. keg	.20	per pound
Ton lots	.18	per pound

The cement RA 518 is supplied for very refractory work. This matures at about 1800° C. and does not fuse at much higher temperatures. This is supplied at the same prices as the cement RA 305.

CRYSTOLON CEMENTS RC 278, 406 AND 498

4006C. Several Crystolon cements have been prepared for use in the construction of small gas or oil furnaces, and these are designated as RC 278, coarse, RC 406, fine, and RC 498, fine (low fusing point).

5-lb. bag	$0.30	per pound
10-lb. bag	.22	per pound
25-lb. bag of keg	.22	per pound
50-lb. keg	.18	per pound
300-lb. keg	.12	per pound
Ton lots	.11	per pound

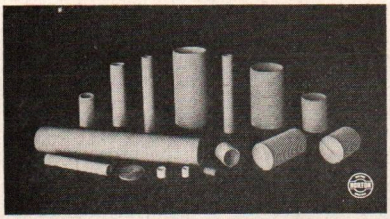
For patching cracked Crystolon muffles the cement RC 535 is particularly desirable, and for other special purposes appropriate mixtures can be supplied.

ELECTRICALLY SINTERED MAGNESIA

4006D. This material is prepared in the electric furnace by heating magnesia to a very high temperature. Its volume is thus reduced to the point of maximum density (3.65) so that subsequent heating does not cause any further shrinkage. It has an appreciable vapor tension, reacting with carbon below its melting point, and has all the general chemical properties of so-called "dead-burned" magnesia. The melting point is between 2300° and 2700° Centigrade, depending on the purity.

This product can be furnished in crushed form.

ALUNDUM WARE

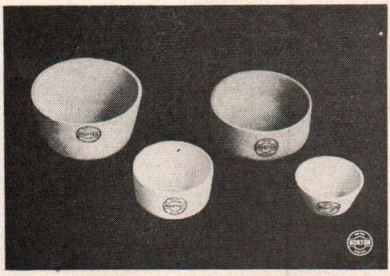


No. 4007A

4007A **ALUNDUM CORES**—For the construction of small wire resistance type electric furnaces these refractory cores meet the criteria of the most efficient material for the purpose. The resistor should be spiralled and wound on the core and then embedded in Alundum cement. Thus, fully protected, the wire does not corrode under the most severe conditions, since the Alundum mixtures are chemically inert. In addition to this the core has high heat conductivity and does not become an electrical conductor even at the highest temperatures obtained in the furnace.

Bore	½	2	2 1–16	2 1–16*	3 ½	5*	5 in.
Length	1 ¼	10	2 7–16	2 7–16	5	9	12 in.
Pitch	¼	1–9	5–16	5–16	5–16	5–16	1–3 in.
Price	$0.82	$6.10	$2.25	$2.50	$5.55	$8.35	$9.45

*One end closed.



No. 4007B

ALUNDUM CAPSULES—Of special shape, advantageous for rapid work. Where an ignition of carbonaceous material is involved, these capsules give excellent results. Cannot be used for alkali fusions.

ALUNDUM IGNITION CAPSULES

	Type	Dia.	Height	Capacity	Price
4007B	12512	1 1/32″	7/16″	7 Cc.	$0.30
4007C	13513	1 ¼″	⅝″	10 Cc.	.40
4007D	10444	1 ¼″	⅝″	10 Cc.	.40
4007E	11470	1 ⅝″	⅝″	18 Cc.	.50
4007F	9743	1 ¾″	⅞″	25 Cc.	.50

Capsules of mixture RA 84.

ALUNDUM FLAME COLLAR

The Alundum flame collar differs from the common type in that the refractory mixture will withstand the highest temperatures obtained with laboratory burners. The supporting triangle fits into the slot, holding the crucible in the center of the space, so that a maximum heating effect is produced.

	Type	Dia.	Height	Mix.	Price
4007G	13082	3 ¼″	3″	R-700	$3.00

ALUNDUM WARE

No. 4008A

ALUNDUM IGNITION CRUCIBLES

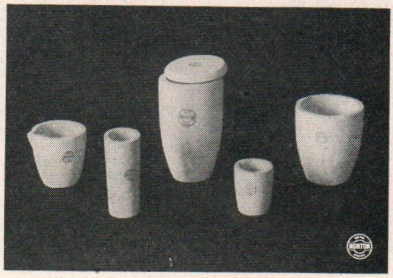
4008A In general laboratory practice where an ignition of carbonaceous material is involved these crucibles give excellent results. The special capsule shape is advantageous for rapid work. These crucibles and capsules cannot be used for alkali fusions.

	Type	Capacity	Height	Top Dia.	Price
4008A	5202	20 Cc.	1 3/16"	1 1/2"	$0.35
4008B	6457	25 Cc.	1 1/2"	1 1/2"	.35
4008C	5203	40 Cc.	1 5/8"	1 7/8"	.40
4008D	6156	Covers for above			.75

ALUNDUM MELTING CRUCIBLES

For melting pure metals, especially those with high melting points, these crucibles are very satisfactory. Sizes larger than those listed are not practicable and instead of such containers graphite crucibles lined with Alundum cement are recommended.

None of the crucibles can be used in contact with slags on account of the absorbent nature of the refractory material.



	Type	Top Dia.	Height	Mix.	Price
4008E	5923	1 3/8"	3 1/4"	RA 221	$2.00
4008F	5922	1 1/2"	2"	RA 84	.75
4008G	13091	2"	3 1/2"	RA 84	2.00
4008H	6820	2 3/8"	2 5/8"	RA 84	1.25
4008I	*6608	2 3/4"	4 3/4"	RA 84	2.00
4008J	5144	3"	3 5/8"	RA 98	2.00
4008K	9421	4"	6"	RA 84	3.00

Dimensions over all.
*With Cover.

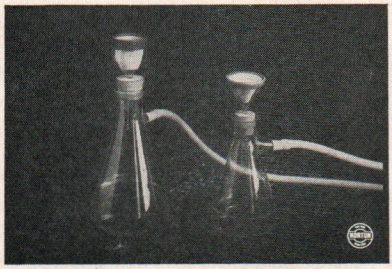
ALUNDUM STANDARDIZING CRUCIBLE

For the calibration of thermocouples the standardizing crucible is so constructed that a hole in the wall permits the introduction of the junction of the wires at a point where the conditions of temperature are most uniform.

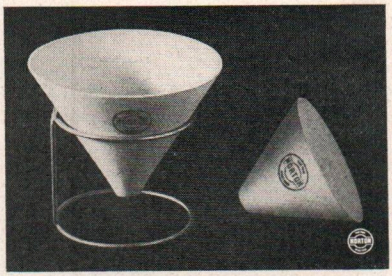
	Type	Out. Dia.	In. Dia.	Height	Mix.	Price
4008L	8152	1 21/32"	1 1/32"	2"	RA 84	$1.50

With cover. Hole in wall 1/8" Dia. x 1 1/4" Deep.

ALUNDUM WARE



No. 4009A



No. 4009C

ALUNDUM FILTER CRUCIBLES—Many problems involving the filtration of chemically active solution have been satisfactorily solved by using a device wherein the filtering medium consisted of bonded Alundum. For the separation of liquids from solids in laboratory practice it is necessary to maintain reduced pressure, in order to effect a rapid filtration. Attention also should be given to the proper fitting of the crucible or other shape in the apparatus so that a close connection is made between the container and the filtering medium.

	Diameter	Height	Capacity	Price
4009A	1 3/8"	1 1/2"	25 Cc.	$0.38
4009B	1 5/8"	1 11/16"	35 Cc.	.45

ALUNDUM FILTER CONES

These cones fit perfectly in the ordinary 60° funnel. The cone is held properly by stretching a rubber gasket over the top of the funnel before introducing the cone. In this way the entire surface of the funnel presents a filtering area for a rapid removal of solid particles from liquids. These cones may be ignited and weighed with accuracy. Light aluminum stands are supplied with the cones for supporting them on the balance pan.

	Type	Diameter	Height	Capacity	Price
4009C	7241	1 3/4"	1 5/16"	20 Cc.	$0.30
4009D	7056	2 1/2"	1 7/8"	50 Cc.	.60
4009E	8031	3"	2 7/16	60 Cc.	.85
4009F	7730	4 1/2"	3 1/2"	100 Cc.	1.50

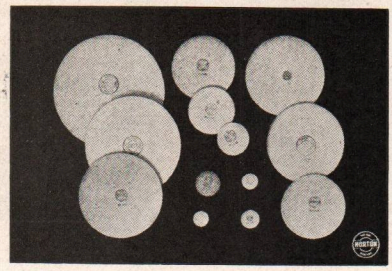
All cones can be furnished in three mixtures: RA 320 dense, RA 321 medium, and RA 322 coarse.

RUBBER GASKETS

	Type	Description	Price
4009G	9914—A	rubber gasket for use with filter dish No. 4857 (moulded shape)	$0.50
4009H	9914—B	rubber gasket for use with filter cone No. 7056 and filter crucible No. 5205	.05
4009I	9914—C	rubber gasket for use with filter cone No. 7241 and filter crucible No. 5204	.05
4009J	7730—A	rubber gasket for use with filter cone No. 7730	.10

ALUNDUM WARE

ALUNDUM FILTER DISCS

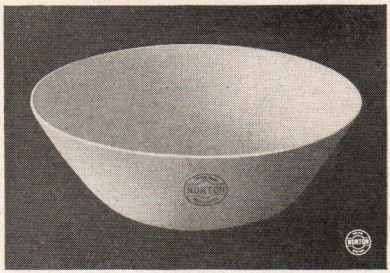


No. 4010A

These discs have proved very serviceable for many special filtering processes, especialls where a small amount of solid matter is present in a large volume of liquid, such as lead sulphate suspended in concentrated sulphuric acid or finely divided particles of carbon in gasoline. They may also be used for filtering dust from air or flue gases.

	Diam.	Thickness	Price	Diam.	Thickness	Price
4010A	¾″	1/16″	$0.40	5″	3/16″	$1.00
4010B	1″	1/16″	.45	6″	3/16″	1.25
4010C	2″	3/32″	.50	7″	¼″	1.50
4010D	3″	⅛″	.60	8″	¼″	1.75
4010E	4″	3/16″	.75			

Thsee are made with a straight edge and also with a 60° bevelled edge to fit the regular size of glass funnels. Two degrees of porosity may be provided, which are designated as RA 98 coarse and RA 225 medium. For sizes different from those listed, the prices are proportional to the nearest inch in diameter. Other shapes, such as squares, rectangles, and strips not exceeding 4 square feet in area and 1 inch thick, may be furnished at similar prices or approximately five cents per square inch.



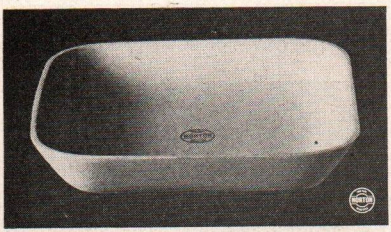
No. 4010F

ALUNDUM FILTER DISHES—Suitable for retaining large quantities of such residues as are encountered in organic preparations and similar work.

	Diameter	Depth	Capacity	Price
4010F	2½″	1″	50 Cc.	$1.00
4010G	4″	2″	300 Cc.	1.37
4010H	5⅝″	2″	400 Cc.	2.25

ALUNDUM WARE

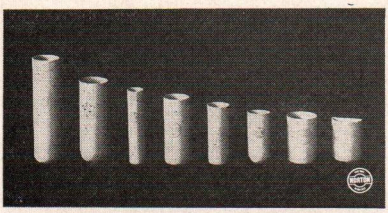
ALUNDUM INCINERATING DISHES



No. 4011A

	Type	Dimensions	Depth	Price
4011A	6936	4 5/8" square	1"	$ 1.50
4011B	6400	2 3/4" diam. round	5/8"	.50
4011C	6954	4"x9 3/4" rectangular	3/4"	3.00
4011D	9671	6 3/8"x12 3/8" rectangular	2 3/16"	6.00
4011E	14066	11"x16" rectangular	2 1/4"	10.00

All dishes of mixture RA 84.



No. 4011F

ALUNDUM EXTRACTION THIMBLES

Alundum extraction thimbles can be used for a wide variety of purposes and can be supplied in sizes suitable for use with the standard types of extraction apparatus. These thimbles remain very constant in weight and are preferable to the paper thimbles in that they may be used an indefinite number of times and permit the ignition of the extracted residue without removing the material from the thimble.

In order to clean an Alundum thimble it is only necessary to place it in a strong solution of acid for a short length of time and then ignite it to constant weight in the usual way.

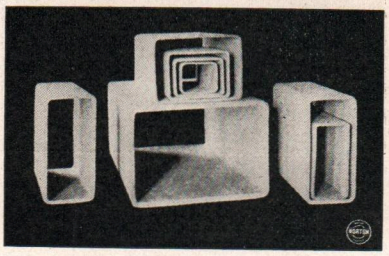
Stock Sizes of Thimbles

	Type	Shape	Out. Dia.	Height	Price
4011F	8133	Round bottom	6 mm.	32 mm.	$0.25
4011G	6389	Flat bottom	19 mm.	90 mm.	.60
4011H	5163	Flat bottom	25 mm.	70 mm.	.70
4011I	5811	Flat bottom	30 mm.	80 mm.	.75
4011J	6406	Round bottom	34 mm.	100 mm.	.90
4011K	6229	Flat bottom	35 mm.	55 mm.	.80
4011L	6945	Round bottom	45 mm.	127 mm.	1.00

Thimbles are supplied in three degrees of porosity: RA 84 dense, RA 360 medium, and RA 98 coarse. Thickness of wall is usually 1 mm.

ALUNDUM WARE

MUFFLES, BOTH ENDS OPEN



No. 4012A

Inside Dimensions

4012A	Type	Height	Width	Length	Wall	Price
	201	2½"	3 3/16"	7"	3/16"	$ 3.50
	202	3"	4¼"	10"	3/16"	6.00
	203	3¾"	5¼"	12"	¼"	8.00
	204	5¼"	7½"	14"	¼"	12.50
	8622	5"	7⅜"	14"	⅜"	15.00
	5956–7	8"	12"	14"	½"	30.00
	5956–8	8"	12"	21"	½"	45.00

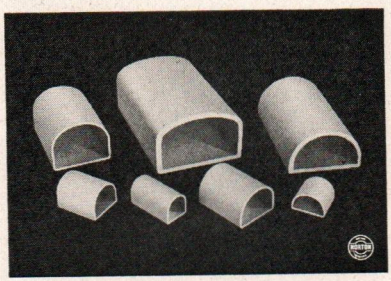
Special Sizes not Carried in Stock (Inside Dimensions)

*7103	1"	7½"	12"	3/16"	$ 7.50
11925	1½"	6"	12"	3/16"	6.00
10889	1½"	8"	14"	¼"	12.00
*7509	2"	8½"	14"	⅜"	12.50
8626	2"	12"	12"	⅜"	16.00
6965	2½"	3½"	12"	¼"	6.00
*7917	2½"	8½"	18"	⅜"	14.00
5910	3"	4¼"	10"	¼"	6.00
11587	3"	6"	18"	¼"	15.00
6133	3"	6½"	12"	¼"	10.00
*14893	3"	8½"	13"	½"	16.00
6634	4"	9"	11"	⅜"	13.50
5502	5"	7¼"	14"	⅜"	15.00
10413	5"	12"	14"	7/16"	23.00
*7060	6"	8"	13¾"	¼"	14.00
7962	6½"	6½"	20"	¾"	22.00
9403	7½"	7½"	16"	5/16"	20.00
3746	8"	12"	28"	½"	60.00
*14453	8"	20"	17"	½"	65.00
*14794	12"	20"	24"	¾"	100.00
12510	16"	16"	14"	¾"	65.00
10701	18"	24"	14"	⅝"	90.00

*One end closed. Other sizes made with one end closed on order; price 10% above list. All muffles are made of mixture RC 217.

ALUNDUM WARE

"D" AND "U" SHAPE MUFFLES. ONE END CLOSED.



No. 4013A

Stock Sizes (Inside Dimensions)

4013A	Type	Height	Width	Length	Wall	Price
	†6766	1 5/8"	2 3/4"	3"	3/16"	$ 5.00
	†6721	2 3/4"	4 5/8"	6"	3/16"	9.00
	†2505	3 1/2"	5 5/8"	11 5/8"	5/16"	15.00
	8723	4 3/8"	5 1/2"	8 1/4"	1/4"	10.00
	6722	5 1/4"	8"	13 1/2"	1/2"	22.00

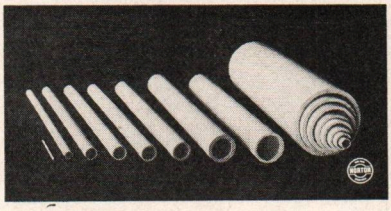
Special Sizes Made to Order. One End Closed.

9368	2 1/8"	3 1/8"	6 1/2"	3/16"	$ 6.00
2634	2 1/2"	3"	3 7/8"	3/16"	5.00
2633	2 5/8"	3 1/2"	6 3/8"	1/4"	7.50
10807	2 5/8"	3 1/2"	19 1/4"	1/4"	20.00
14520	3"	4"	3 1/2"	3/16"	6.75
*6972A	3 1/16"	4 3/4"	9 13/16"	1/4"	7.50
*10962	3 3/8"	5 5/8"	19 1/2"	3/8"	8.00
†6604	3 5/8"	6 1/2"	12"	7/16"	15.00
10871	4"	7"	7"	1/4"	12.00
6815	4 1/8"	6 1/8"	12 5/8"	3/8"	14.00
12072	4 1/4"	4"	10 1/4"	1/2"	10.00
8490	5 5/8"	11 1/4"	14 1/2"	3/8"	24.00
12782	5 3/4"	14 1/8"	21"	1/2"	45.00
6299	6 1/8"	10 1/2"	18"	11/16"	35.00
9416	6 1/4"	6"	17 3/8"	3/8"	25.00
8602	7 1/2"	13"	13"	3/8"	33.00
6822	7 1/2"	15 1/4"	22"	1"	50.00
*6567	9 13/16"	10 7/8"	26 1/4"	1"	50.00
14092	12"	12"	15"	3/8"	48.00

All muffles are made of mixture RC 217 unless specified otherwise.
*Both ends open. Blueprint of any muffle supplied on request.
†D-shape; others are U-shape.

ALUNDUM WARE

ALUNDUM TUBES



No. 4014A

4041A. These tubes of bonded fused alumina have been used with considerable success for electric furnaces of the wre resistance type. They are particularly serviceable as a refractory support for quartz combusition tubes. Many special adaptions have been found for the tubes, and conbenient containers for high temperature work are obtained by using short lengths of the large tubes with one end closed.

Following are stock sizes of these tubes:

Bore	Wall	12" long	18" long	24" long
½"	⅛"	$ 2.00	$ 3.00	$ 4.00
⅝"	⅛"	2.00	3.00	4.00
¾"	⅛"	2.00	3.00	4.00
⅞"	⅛"	2.00	3.00	4.00
1"	⅛"	2.00	3.00	4.00
1⅛"	3/16"	2.50	3.75	5.00
1¼"	3/16"	2.50	3.75	5.00
1⅜"	3/16"	3.00	4.50	6.00
1½"	¼"	3.00	4.50	6.00
1⅝"	¼"	3.50	5.25	7.00
1¾"	¼"	3.50	5.25	7.00
1⅞"	¼"	4.00	6.00	8.00
2"	⅜"	4.00	6.00	8.00
3"	⅜"	6.00	9.00	12.00
4"	⅜"	8.00	12.00	16.00
5"	⅜"	12.00	15.00	18.00
6"	½"	16.00	20.00	24.00
Special sizes made on order				
7"	½"	20.00	25.00	30.00
8"	½"	24.00	30.00	36.00
9"	½"	26.00	32.50	39.00
10"	½"	28.00	35.00	42.00
11"	½"	30.00	37.50	45.00
12"	½"	32.00	40.00	48.00

For tubes of lengths other than those given, the prices are proportional, in multiples of three inches, to those next greater in length. A charge of 10% additional is made to any of these prices for closing one end of the tube.

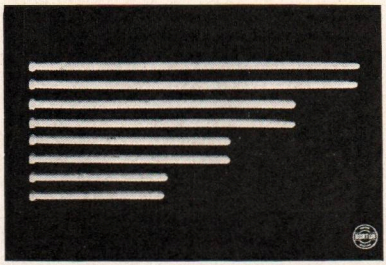
Other sizes and shapes can be supplied at corresponding prices. All tubes are made of mixture RA 98.

CRYSTOLON TUBES

4014B. Crystolon tubes of bonded silicon carbide have been found useful in some operations, and these are prepared in the above sizes when required.

ALUNDUM WARE

ALUNDUM PYROMETER TUBES



No. 4015A

4015A. The conditions of temperature in furnaces and kilns are accurately recorded when the thermocouples are protected with Alundum pyrometer tubes. The high heat conductivity of Alundum ware makes these tubes very sensitive in transmitting slight variations of temperature. Each tube is subjected to a rigid test for impreviousness.

The standard shape is supplied in lengths 8", 12", 18", 24", 27", 30", 36", 39", 42" and 48". Mixture RA 84.

Type	Bore	Outside Dia.	Wall	Price Per In.
6049	7/16"	11/16"	1/8"	$0.30
	Other sizes made on order			
11047	3/16"	3/8"	3/32"	.30
10923	1/4"	1/2"	1/8"	.30
12680	3/8"	5/8"	1/8"	.30
13147	3/8"	3/4"	3/16"	.30
10147	9/16"	15/16"	3/16"	.40
12189	5/8"	1"	3/16"	.40
6323	3/4"	1 1/4"	1/4"	.40
10674	7/8"	1 1/8"	1/8"	.50
11235	7/8"	1 3/8"	1/4"	.50
11620	1"	1 1/4"	1/8"	.50
10244	1"	1 1/2"	1/4"	.50
11441	1 1/8"	2"	7/16"	.50

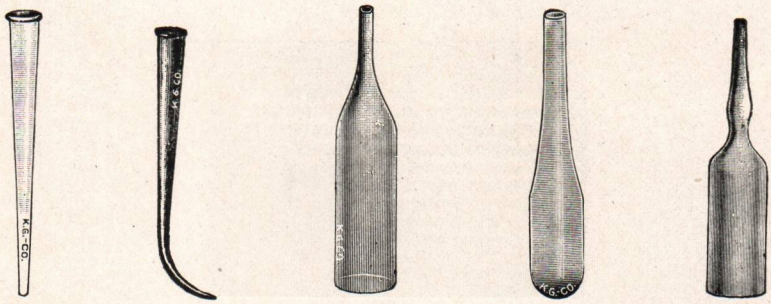
Crystolon tubes of the above sizes can also be furnished.

ALUNDUM CONICAL CORE

In the distillation of organic substances, the electric current may be used instead of gas. An Alundum conical core has been found useful in this construction, serving as the heating element and as container for the distilling flask. The shape permits of different sizes of flasks being employed and the apparatus may be readily assembled. Distillation of inflammable materials is much more safely carried out and uniform temperature conditions are more easily obtained than with other methods of heating.

	Type	Inside Top Dia.	Inside Height	Price
4015C	13875	3 3/4"	3"	$5.00
4015D	13625	5 1/2"	4 7/16"	6.00

AMPOULES



4016A 4016B 4016C 4016D 4016E

4016A **ADAPTERS**—Straight form; light wall, lamp blown; for connecting retorts with receivers. Type 7000.

Total length, inches	6	7	8	10
Inside diameter at large end, inches	¾	1	1¼	1½
Each	$0.22	.24	.30	.36

4016B **ADAPTERS**—Curved; light wall, lamp blown; these are made with small end at 45 degrees, 90 degrees or 135 degrees angle; angle must be specified. Type 7005.

Total length, inches	6	7	8	10
Inside diameter at large end, inches	¾	1	1¼	1½
Each	$0.22	.24	.30	.36

4016C **AMPOULES**—Drawn stems, either flat or round bottom. These ampoules are made from glass specially manufactured for this purpose; contains a very low percentage of alkali. In flint only. Type 7010.

Capacity, cc.	1 to 2	3 to 4	5 to 6	7 to 8
Gross	$3.50	4.50	5.00	5.25
Capacity, cc.	9 to 10	15	20	25	50
Gross	$6.25	6.50	6.75	7.00	10.50

4016D **AMPOULES**—Drawn stem, either flat or round bottom. Furnished in flint or amber. Type 7015.

Capacity, cc.	1 to 2	3 to 4	5 to 6	7 to 8
Gross	$2.80	3.50	4.00	4.20
Capacity, cc.	9 to 10	15	20	25	50
Gross	$5.00	5.20	5.50	5.60	8.50

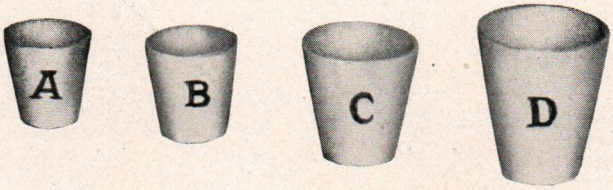
4016E **AMPOULES**—With constriction in stem; either flat or round bottom. Furnished in flint only. Type 7020.

Capacity, cc.	1 to 2	3 to 4	5 to 6	7 to 8
Gross	$3.85	4.95	5.50	5.75
Capacity, cc.	9 to 10	15	20	25	50
Gross	$6.75	7.00	7.25	7.50	11.00

4016F **AMPOULES**—Same style as No. 7020. Furnished in flint or amber. Type 7025.

Capacity, cc.	1 to 2	3 to 4	5 to 6	7 to 8
Gross	$3.10	3.85	4.40	4.60
Capacity, cc.	9 to 10	15	20	25	50
Gross	$5.40	5.60	5.80	6.00	8.80

ANNEALING CUPS AND CUP TRAYS



No. 4017B

4017A **ANNEALING CUPS, "MASSCO."**

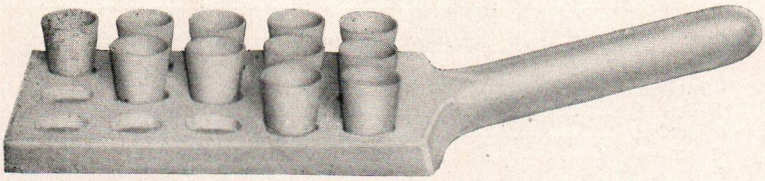
Type	Size	Per doz.
0	1⅛x1⅛	$1.30
1	1¼x1¼	1.30
2	1½x1½	1.30

COVERS, for above sizes ..... .35

4017B **ANNEALING CUPS, "BATTERSEA."**

Type	Size	Per doz.
A	1⅛x1⅛	$1.50
B	1¼x1¼	1.50
C	1½x1½	1.60
D	1¾x1¾	1.60

COVERS, for above sizes ..... .45



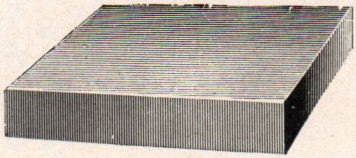
No. 4017C

4017C **ANNEALING CUP TRAYS.** Fire Clay. A great convenience when handling cups while in muffles ..... each $0.80

4017D **ANNEALING CUP TRAYS.** Tinned Iron. Detachable wood handle. Made to hold 12 porcelain cups, sizes No. 0 to 00 ..... each 1.00
Other sizes made to order.

ANVILS

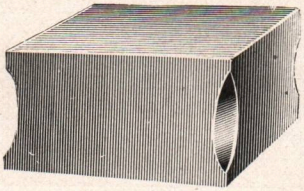
No. 4018A



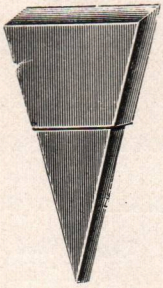
No. 4018B

4018A **ANVIL. PLATTNER'S.** 1½x1½-inch, for Blow Pipe work: Polished Steel ..... each $0.75

4018B **ANVIL.** For Lead Buttons. 6x6-inch, planed on one side..each 1.75



No. 4018C



No. 4018D

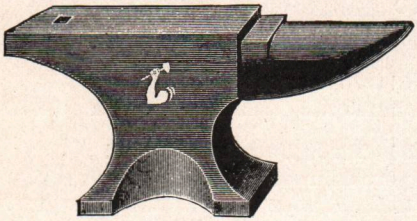
4018C **ANVIL.** Square, Solid Steel, Mirror Polished Face.

Size Inches	Price Each
2 x2	$1.75
2½x2½	2.25
3 x3	2.75
4 x4	3.25

4018D **ANVIL.** Square, with Point, Solid Steel, Mirror Polished Face.

Face Inches	Price Each
1½x1½	$1.50
2¼x2¼	3.50
3 x3	7.00

4018E **ANVIL.** Regular Shape, Steel Face, for use on Table.

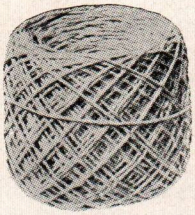


No. 4018E

Weight Pounds	Face Inches	Price Each
5	4	$2.80
10	5	3.85
15	5½	4.55
20	6¼	5.60
30	7	6.30
50	8½	8.40

ASBESTOS GOODS

ASBESTOS CORD.



No. 4019A

4019A. A fire and acid-proof Asbestos Cord, with strong, hard-twisted strands. Especially valuable for suspending metals, retorts and crucibles in contact with fire and heat.

Sizes: $\frac{1}{16}$ to $\frac{3}{8}$ inch in diameter.

Weights: ¼, ¼ and 1-pound balls, 5 and 10-pound spools, 25 and 50-pound reels.

List price per lb., pure.....$2.00
List price per lb., commercially pure..... 1.50

ASBESTOS PAPER.

4019B. Asbestos Paper is used principally as a protection against heat or as a fire retardant between walls, floors and ceilings.

Special grades of Asbestos Paper are supplied for use in the filtration of chemicals and in electrolytic and kindred processes.

Approximate weights and thicknesses of Asbestos Paper and Roll Board:

Approximate Weight per 100 sq. ft.	Approximate Thickness	Prices Upon Application
16 lbs.	$\frac{1}{32}$	--------
38 lbs.	$\frac{1}{16}$	--------
66 lbs.	⅛	--------

No. 4019B

No. 4019C

ASBESTOS OVERALLS.

4019C. These Overalls are made from heavy, durable asbestos cloth, with double sewn reinforced seams, one seam in the leg and adjustable suspender straps fastened with sliding wire buckles. Cut like regular overalls and lined throughout with heavy duck.

Prices on application. State sizes desired.

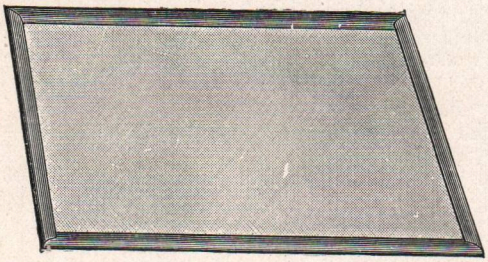
ASBESTOS COAT.

4019D. Substantially constructed from high-grade asbestos cloth, lined throughout with heavy duck. Blind seams and riveted buttons. Withstands intense heat, acids and chemicals. Made in any size.

Prices on application.

No. 4019D

ASBESTOS GOODS



No. 4020A

SQUARE ASBESTOS PADS. For protecting the table during blowpipe operations. They are made from Asbestos board about one-fourth of an inch thick, and edged with iron. They are incombustible, and excellent non-conductors of heat. The advantages to be derived by their use during blowpipe work are too obvious to need further explanation. The two smaller sizes, Nos. 00 and 0, are especially designed for supporting small articles while soldering.

PRICES

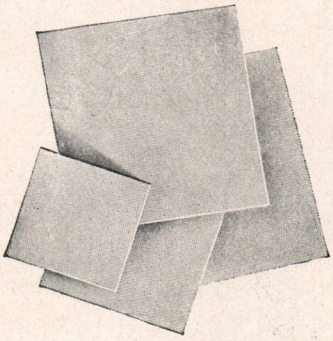
4020A	Type	00	ap.	4	in. x	4	in. x	¼	in.	$0.15
4020B	Type	0	ap.	8	in. x	8	in. x	¼	in.	.40
4020C	Type	0½	ap.	6	in. x	6	in. x	¼	in.	.35
4020D	Type	1	ap.	6½	in. x	10	in. x	¼	in.	.50
4020E	Type	2	ap.	10	in. x	13	in. x	¼	in.	.85
4020F	Type	3	ap.	13	in. x	20	in. x	¼	in.	1.50

TRANSITE ASBESTOS WOOD

4020G. When permanence and positive fire-proof qualities are demanded in any structure, Transite Asbestos Wood meets the strictest requirements for building material. It is an all-rock material positively fire-proof and practically ever-lasting.

In appearance Transite Asbestos Wood varies according to the purpose for which it is used. In the rough, it presents a gray surface, which requires no painting. Planed, it takes paint, varnish or graining in remarkably true imitation of slate, marble ro any hardwood.

It is comparatively light in weight, approaches wood in ease of working and is not subject to breakage on shipping. These qualities have brought Transite Asbestos Wood into general use as a fire barrier in walls, partitians, doors, etc. It is applied in sheets in much the same way as ordinary lumber.



No. 4020G

SIZES.

Can be furnished in standard size sheets 46 in. x 48 in., 42 in. x 48 in., 42 in. x 96 in. in three thicknesses. On special cut pieces, extra charges will be made for labor and waste in all cases.

FINISHES

1. **Unsanded.** The standard sheet just as it comes from the press, reasonably smooth on one side, pebbled surface on the other.
2. **Sanded on One Side.** Standard sheet with true surface on one side only—other side more or less rough.
3. **Sanded on Two Sides.** Standard sheet brought to a true surface on both sides—all traces of roughness removed.

Prices on application.

ASBESTOS GOODS

ASBESTOS GLOVES AND MITTENS

STYLS "A"

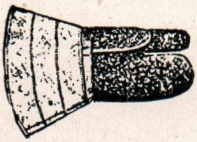
No. 4021A

4021A For use in glass, chemical, iron and smelting works, or wherever the handling of heated surfaces demands an efficient protection for the hands.

Style "A" mitten consists of a full hand mitten with thumb, plain or reinforced palm and thumb, asbestos gauntlet.

Price $4.00

STYLE "B"

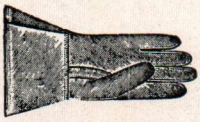


No. 4021B

4021B Style "B" consists of a full hand mitten with thumb and one finger, plain or reinforced palm and thumb, asbestos gauntlet.

Price $4.50

STYLE "C"



No. 4021C

4021C Style "C" glave has four fingers and thumb, plain or reinforced palm and thumb, asbestos gauntlet.

Prices on application.

ASBESTOS CLOTH

4021D There is no worthy substitute for asbestos as a fabric to be used in protective clothing for workers in iron and smelting plants. There is no purpose for which asbestos is used, where there is greater necessity for the purest, toughest asbestos fibres than in safety apparel.

Type 6190	Weight 2	lbs. to sq. yd.	$ 5.00
Type 444	Weight 2¼	lbs. to sq. yd.	6.00
Type 912	Weight 2	lbs. to sq. yd.	12.00

ASBESTOS MILL BOARD

4021E Comes in sheets 40 in. v 40 in., 1/8 in. to ½ in. thickness.

ASBESTOS FIBER

4021F Price per pound to 100 pounds on application.

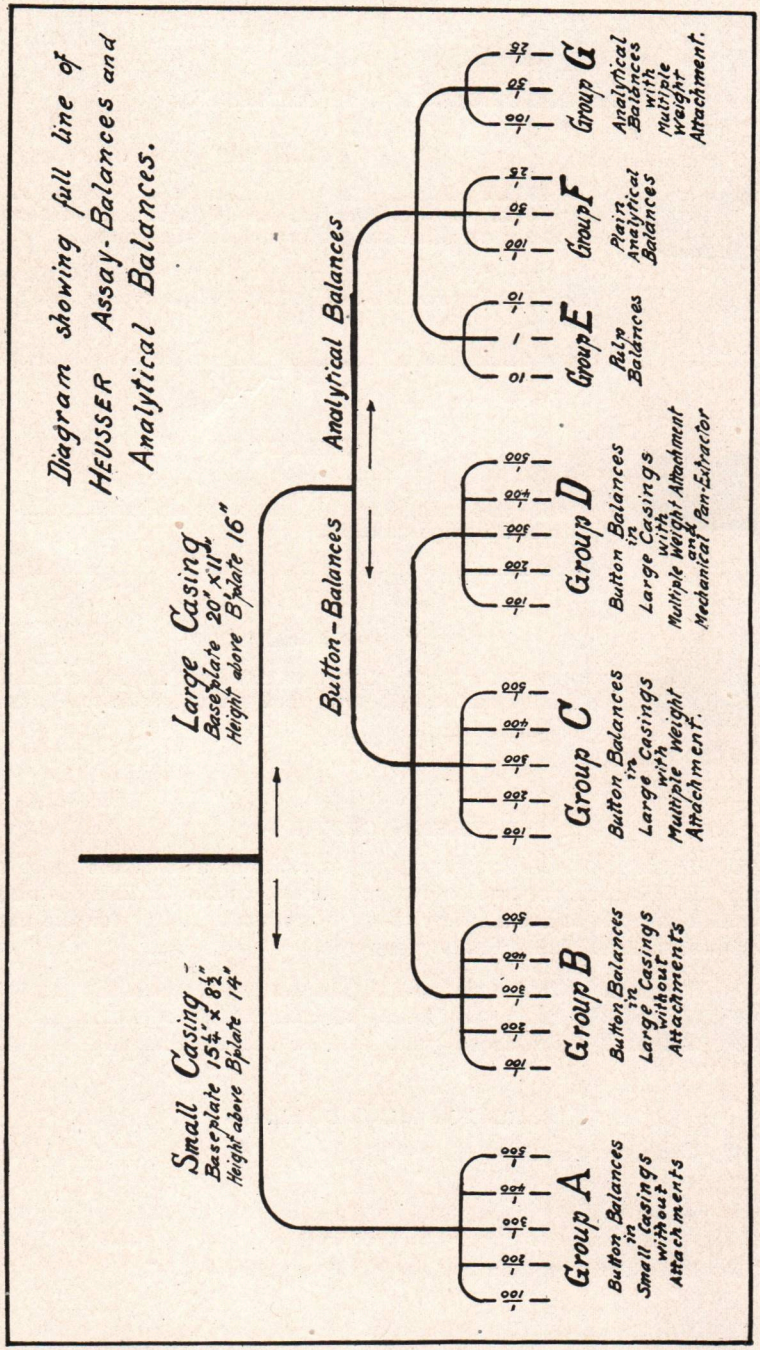


Diagram showing full line of HEUSSER Assay-Balances and Analytical Balances.
Small Casing
Baseplate 15¼" x 8¾"
Height above B'plate 14"
Large Casing
Baseplate 20" x 11"
Height above B'plate 16"
Button-Balances
Analytical Balances
Group A
Button Balances in Small Casings without Attachments
Group B
Button Balances in Large Casings without Attachments
Group C
Button Balances in Large Casings with Multiple Weight Attachment.
Group D
Button Balances in Large Casings with Multiple Weight Attachment and Mechanical Pan-Extractor
Group E
Pulp Balances
Group F
Plain Analytical Balances
Group G
Analytical Balances with Multiple Weight Attachment.

No. 4022A

HEUSSER BALANCES

Manufactured Exclusively for The Mine & Smelter Supply Co.

The Price Worthiest Balances Though not the Cheapest.

Heusser Balances have always held a unique position in the balance field, owing to the correctness of their general design, judicious selection of their material, perfect workmanship, pleasing and enduring finish. In addition to these qualities the designer of the Heusser Balances has invented and perfected several attachments for balances which have met with considerable success among Assayers, Chemists and Scientific Research workers. The characteristic and distinguishing features of the Heusser Balances are as follows:

All Metal Construction of the Balance Casing.

Unit construction of the Balance mechanism.

Keyboard operated Multiple Weight Attachment.

Mechanical Pan Extractor.

Illuminator and Protector.

The different types of balances, which may be grouped and assembled with these characteristic features are shown by the diagram on page.

BALANCE CASING

A very important feautre of every balance is the Balance Casing. The old fashioned wooden casing is afflicted with a long list of defects and ailments. It has not much mechanical strength. It is subject to the influences of the weather. It will shrink, swell, crack, warp or otherwise get out of shape or joints and has under the best conditions only a short existence.

All those annoying and irritating influences known as "Magnetism" or "Electricity" have their seat in the old style wooden balance casing.

The Heusser All Metal Balance Casing is free from all above mentioned defects and with the exception of electrifying the glass panels by rubbing, it is also free from all "magnetic" and "electrical" disturbances. It is strong, admits an unusual amount of light and baring violent accidents, it will maintain it's shape, alignment and finish indefinitely and is practically indestructible. The All Metal Construction of the Heusser Balance casing permits a continuous illumination without interferring with the accuracy and actual experience has shown that it is very advantageous to set up the Heusser balance in a dark room and to perform all the weighing with electrical illumination exclusively.

UNIT BASE AND RELEASING MECHANISM

The central mechanism, patented, supporting the beam, hangers, and riderbar, forms a compact unit and is simplicity in itself. It consists of a round base containing in front two sensitive level vials. Upon the upper side of this base is mounted a hollow column, in which two vertical slides are operable by means of the front knob. One of these slides supports the beam, the other one supports the hangers and the pan rests. From the lower side of the round base extends a sh ort shaft, underneath the casing, supporting the operating mechanism.

Large wearing surfaces are provided in order to insure ample lubrication of the moving parts.

HEUSSER BALANCES

BEAM, EDGES AND BEARINGS

The "soul" of a balance is the beam with its edges. In accordance with this fact the greatest care possible is given to these parts. The design of the truss beam (patented) is perfect, insuring the maximum of strength with the minimum of weight.

Edges and bearings are fully exposed to sight and are made of selected Cornelian Agate.

At rest all edges are relieved from their respective bearings.

The length of the beam for all types of balances is 6 ¼".

The period of oscillation is the same as for the previous length of 5". This result is accomplished by a more judicious construction of the beam. The greater length of the beam makes 25% larger divisions which are more distinct and clear to the eyes of the observer.

All beams are equipped with the new Heusser direct reading rider scale, which excludes all possible errors in reading the position of the rider upon the scale.

The beam with the rider scale is placed close to the door, in order that the weigher may observe the reading from a certain distance and thereby does not influence the balances with his own body heat.

MATERIALS

The best material obtainable is used throughout in the manufacture of these balances.

GENERAL DESIGN

The general design is very graceful and, owing to the simplicity of the construction, the high quality of material and workmanship, these balances are bound to give long and satisfying service.

BALANCE PROTECTOR AND BALANCE ILLUMINATOR—Patented

This accessory consists of a substantial sub-base which may be screwed upon the bench or table, and a spacious hood traveling along two upright guides.

The front part of this sub-base may be covered with a glass plate and underlaid with green billiard cloth.

Upon the front partr ests the balance. which is fully enclosed by the balance over when drawn down. The edge of this cover is felt lined, thus making a perfectly dustproof joint with the glass plate.

A specially designed latch pulls the cover downward and, if deemed necessary, this latch may be locked by means of a padlock.

Two upright guide bars are mounted upon the rear part of the sub-base. These guide bars are solidly braced backward and sideward by means of slanting guy bars. At the top all these bars are connected together by means of a transversal bridge carrying in its middle a pulley over which the cover is counterweighted.

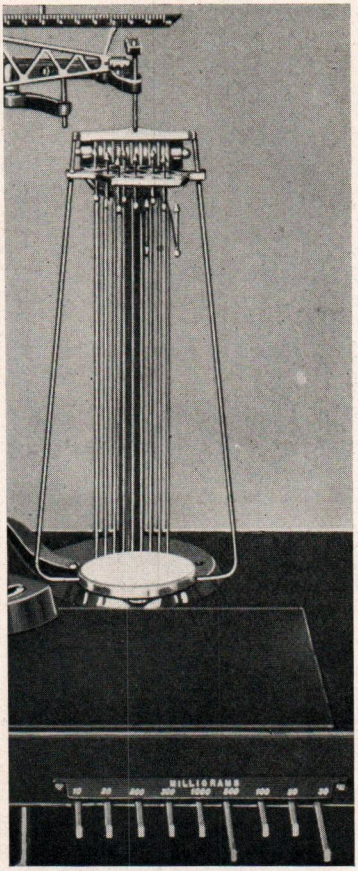
By means of four pairs of rollers the balance cover travels along these upright guide bars.

Inside of the balance cover three frosted electric light bulbs are placed in such a manner that when the balance cover is lifted above the index scale the light is thrown directly upon all the balance parts, beautifully illuminating them in a subdued light.

An automatic cut-off switch is provided to interrupt automatically the circuit as soon as the balance cover is drawn over the balance, thus eliminating the possibility of leaving the lamps burning and heating the balance.

HEUSSER BALANCES

MULTIPLE WEIGHT ATTACHMENT



No. 4025A

This attachment was designed in response to a general demand for a time and labor-saving weighing instrument. By its use the tedious task of picking up and placing small weights upon the balance pans, and arresting the balance each time for this purpose, is eliminated.

With reference to the accompanying illustration, the pan hanger on the right side carries a perforated plate or grid. Back of this pan hanger a short column is solidly mounted upon the base plate, carrying nine movable levers. The front end of each of these levers carries an upright conically-tipped staff, which moves centrally and vertically through the perforations of the grid.

The levers are operated from the outside by means of depressable push keys arranged similarly to a typewriter keyboard, and located in front of the balance.

The illustration shows seven levers in their uppermost position, with the weights at rest, and two levers in their lowermost position, with their weights deposited upon the grid.

The weights are in the form of discs, each disc having a central perforation. At rest they are supported by means of the conically-tipped staffs, which extend partly into the perforations. When in use they are deposited in countersunk holes in the grid. These weights may be deposited and again picked up independently of each other, and while the balance beam is free to swing by simply pushing the depressable keys up and down.

This multiple weight attachment is the only device which effectively solves the problem of mechanically manipulating the weights without introducing new complications liable to errors.

The value of each weight is plainly marked upon an index plate placed above the keyboard, and the possibility of making mistakes is positively excluded.

The capacity of the weights is 221 milligrams for Assay Balances, and divided as follows: 1, 2, 3, 5, 20, 30, 50 and 100 milligrams.

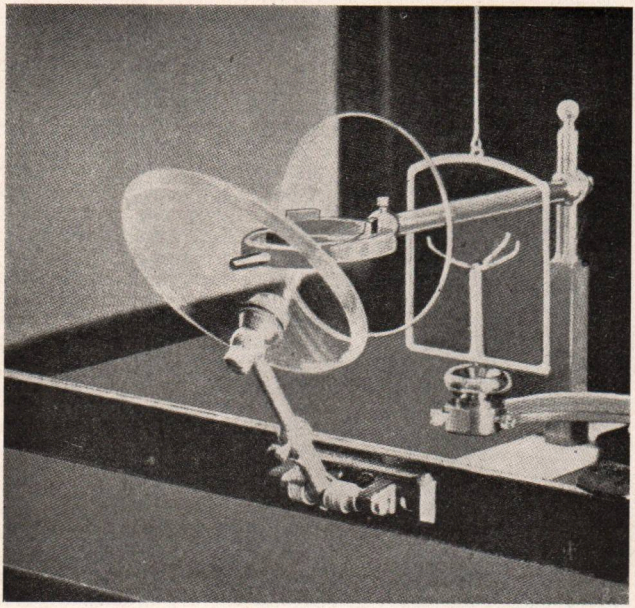
For extremely delicate weighings, where the ½ milligram rider is used, the capacity is only 121 milligrams.

Since the greater part of "buttons" will come within this range, the handling of weights with tweezers is almost eliminated.

This attachment will save 50 per cent of the time consumed in weighing with an ordinary balance, and for assay offices where considerable weighing must be done, this will amount to a great deal.

For Analytical Balances, the weights are ten times heavier, or 2,220 milligrams in all.

HEUSSER BALANCES



No. 4026A

DETAIL OF THE MECHANICAL PAN EXTRACTOR

In This Illustration the Pan Has Been Raised from Its Support on the Hanger and Transferred to the Outside of the Balance Door

MECHANICAL PAN EXTRACTOR

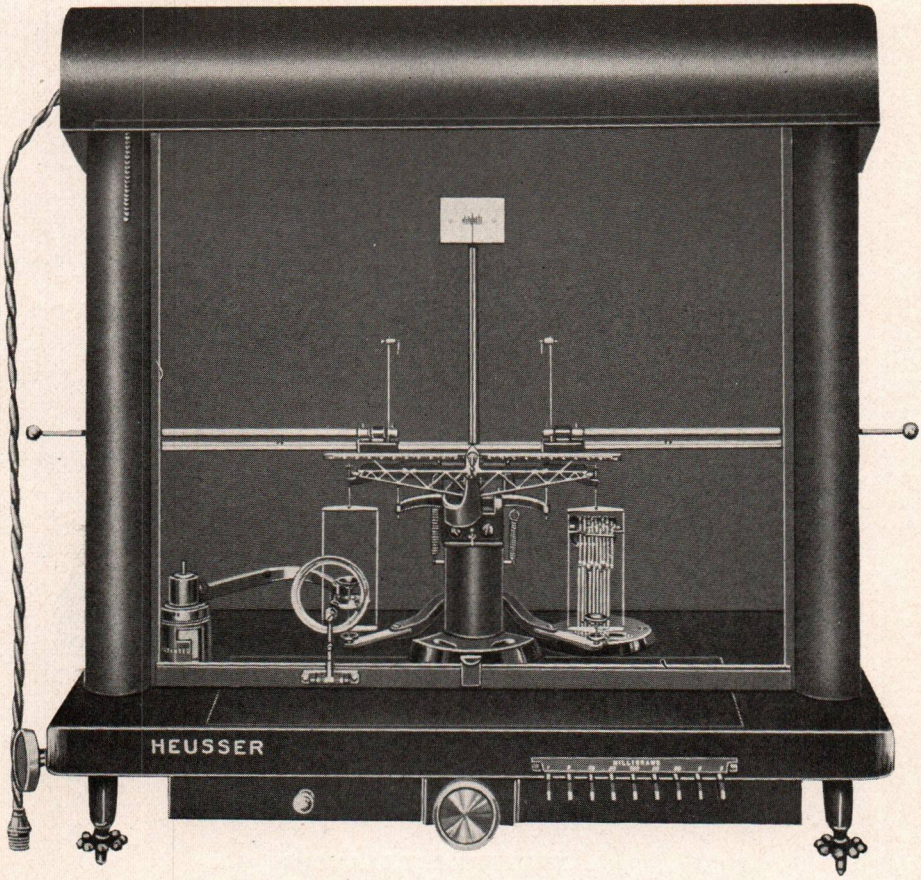
This arrangement (patented) enables the assayer to place the "button" into the weighing pan, also to get it out again without opening the balance door. This consequently prevents dust and disturbing air currents from getting inside the balance casing. The movement of this Pan Extractor is very rapid and the possibilities of upsetting and damaging the beam and hanger are positively eliminated.

With reference to the photograph, the balance pan on the left side is supported in the center of the hanger frome. Back of this frame a vertical post protrudes from underneath the balance sub-base. This post is actuated through the knob located in front of the balance, and has an alternative vertical and horizontal motion.

At the top of this post is clamped a horizontal arm, which reaches forward into the hanger frame. The forward end of this horizontal arm has three centrally projecting prongs, into which the balance pan fits.

A round hole, 1¼″ diameter, is drilled into the glass panel of the balance door through which the pan is brought outside of the balance casing. This hole is covered by a crystal shutter, which is automatically opened and closed through the operation of the front knob.

HEUSSER BALANCES



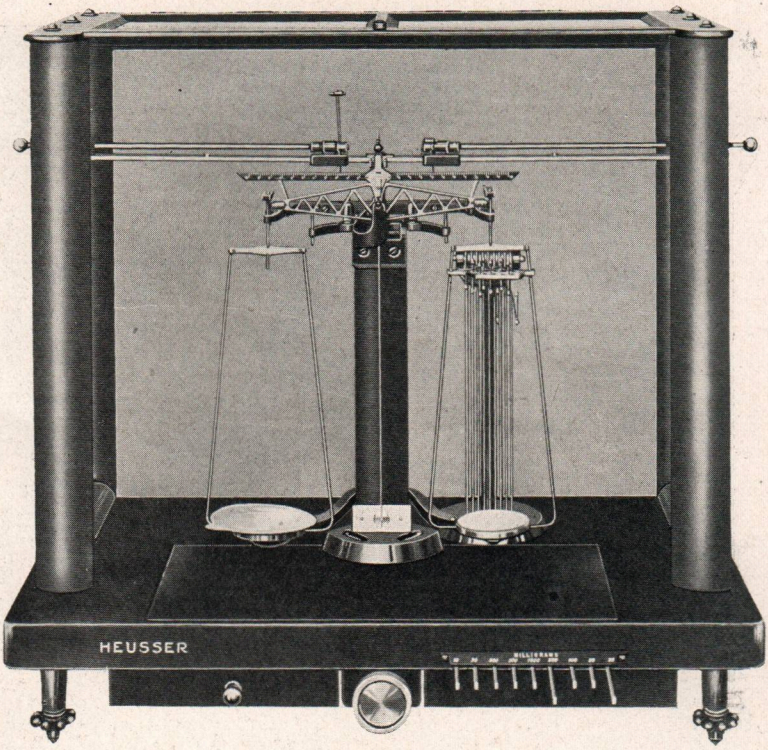
No. 4027A

BUTTON BALANCES

4027B	Group A	1/100	1/200	1/300	1/400	1/500
		$150.00	$175.00	$200.00	$235.00	$275.00
4027B	Group B	1/100	1/200	1/300	1/400	1/500
		175.00	200.00	225.00	260.00	300.00
4027C	Group C	1/100	1/200	1/300	1/400	1/500
		240.00	260.00	285.00	315.00	350.00
4027D	Group D	1/100	1/200	1/300	1/400	1/500
		290.00	310.00	335.00	365.00	400.00

See Diagram Page 22.

HEUSSER BALANCES



No. 4028A

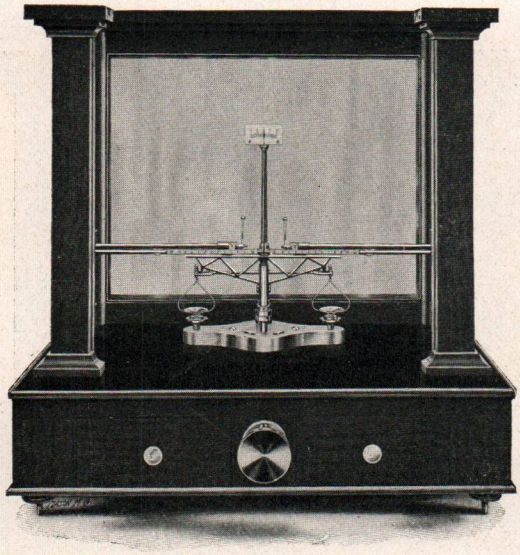
ANALYTICAL BALANCES

4028A	Group E	10 mg.	1	1/10
		$100.00	$105.00	$110.00
4028B	Group F	1/25	1/50	1/100
		150.00	160.00	175.00
4028C	Group G	1/25	1/50	1/100
		230.00	240.00	260.00

See Diagram Page 22.

BALANCES

AINSWORTH



No. 4029A

TYPE V ASSAY BALANCE

5-inch, 12-7 Cm., Beam. Sensitivity 1-500 Mg.
Period of oscillation 7 seconds.

4029A This balance embodies the latest improvements in inverted type balances as described in the preceding pages. To secure the highest degree of accuracy is it adjusted to 1-500 milligram sensitivity which is afterwards reduced to 1-200 milligram to increase its speed and stability and to decrease the effect of extraneous influences, but where conditions are favorable for operation at its highest sensitivity this may be increased by raising the center of gravity.

All metal work heavily gold plated.

The counterpoised sliding door has been removed to better illustrate the balance.

Weight, net, 22 pounds. Packed for export in zinc-lined case, 80 lbs. (36 kilos). Cubic measurement, 7.5 feet.

Dimensions, 28 x 22 x 16 inches, packed.

Price $300.00

TYPE VB ASSAY BALANCE

With improved multiple rider carrier.
5-inch, 12.7 Cm., Beam. Sensitivity 1-200 Mg.
Period of oscillation 7 seconds.

4029B This balance is similar to the type V, excepting that it is not provided with releasing machanism for the end bearings, which are grooved instead of agate planes. With improved multiple rider carrier.

The counterpoised sliding door has been removed to better illustrate the balance.

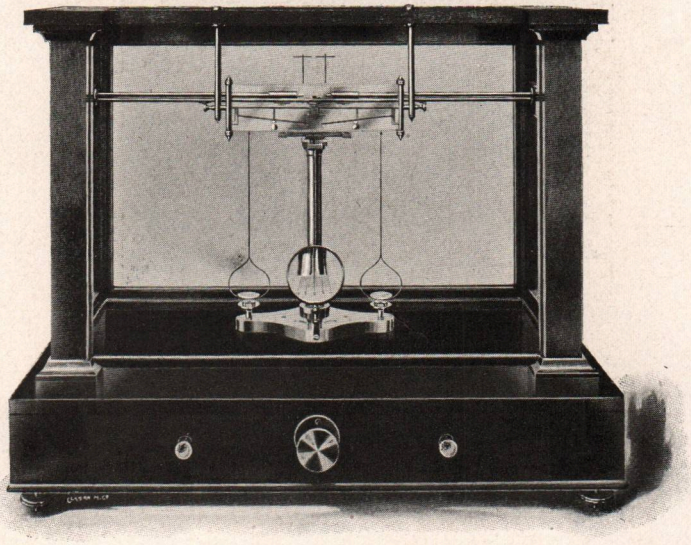
All metal work heavily gold plated.

Dimensions of case, weight, etc., same as Type V.

Price, with multiple rider carrier as shown $290.00
Price, without multiple rider carrier 250.00

BALANCES

AINSWORTH'S



No. 4030A

TYPE A ASSAY BALANCE

5-inch, 12.7 Cm., Beam. Sensitivity 1-200 Mg.

Period of oscillation 7 seconds.

4030A For accurate and rapid weighing, and used by many assayers having a large volume of work.

The beam is of brass, straight on top and with 50 divisions each side of the center reading to 1-50 milligramme with a 1 milligramme rider, or to 1-100 milligramme with a ½-milligramme rider, finer readings being taken by subdividing the divisions with the eye, a specially ground reading glass being provided. The beam is unobstructed on top, and a rider may be placed anywhere from 0 at the center to the last division at either end, which is directly over the end edge and represents the full weight of the rider used.

All edges and bearings are of agate. Has fall-away pan-rests, improved base, rider apparatus and releasing mechanism, plate-glass sub-base and skeleton hangers. In French polished mahogany case with counterpoised sliding door. Dimensions, 20x17x10 inches.

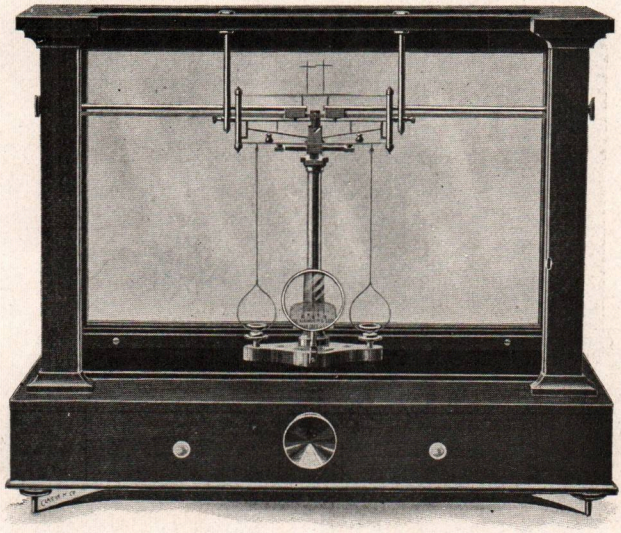
Weight, net, 22 pounds. Packed, 50 pounds. Packed for export in zinc-lined case, 80 pounds (36 kilos). Cubic measurement, 7.5 feet.

Dimensions, 28 x 22 x 16 inches, packed.

Price $250.00

BALANCES

AINSWORTH'S



No. 4031A

TYPE F ASSAY BALANCE

4-inch, 10 Cm., Beam. Sensitivity 1-200 Mg.

Period of oscillation 6 seconds.

4031A This balance, having a beam but four inches long, is very rapid and has all the latest improvements, including reading glass for beam, improved rider apparatus and base, fall-away pan-rests, plate-glass sub-base, skeleton hangers.

The beam has 50 divisions each side of the center reading to 1-50 milligramme with a 1 milligramme rider or to 1-100 milligramme with a ½ milligramme rider, finer readings being taken by subdividing the divisions with the eye. It is unobstructed on the top, and the rider can be placed at any point from the 0 at the center to the last division at either end, which is directly over the end edge and represents the full weight of the rider used. All edges and bearings are of agate.

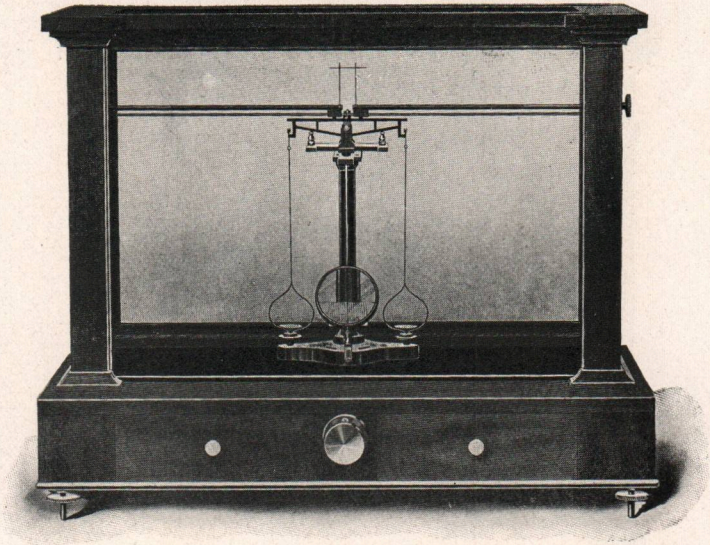
Has French polished mahogany case with counterpoised sliding door, all of thoroughly seasoned lumber.

Dimensions, weights, etc., same as Type A.

Price $250.00

BALANCES

AINSWORTH'S



No. 4032A

TYPE FB ASSAY BALANCE

4-inch, 10 Cm., Beam. Sensitivity 1-100 Mg.
Period of oscillation 4½ seconds.

4032A This balance has heavy 4-inch beam and is suitable for accurate and rapid gold and silver button weighing.

It has all latest improvements, including fall-away pan-rests, agate edges and bearings, skeleton hangers, double rider apparatus, unit base construction plate-glass sub-base, reading glass for index, etc.

Dimensions, 20 x 17 x 10 inches.

In the engraving the sliding door has been removed to better illustrate the balance.

Weight, net, 22 pounds. Packed, 50 pounds. Packed for export in zinc-lined case, 80 pounds (36 kilos). Cubic measurement, 7.5 feet.

Dimensions, 28 x 22 x 16 inches, packed.

Price $175.00

TYPE EA ASSAY BALANCE

No. 4032B

5-inch, 12.7 Cm., Beam. Sensitivity 1-100 Mg.
Period of oscillation 5 seconds.

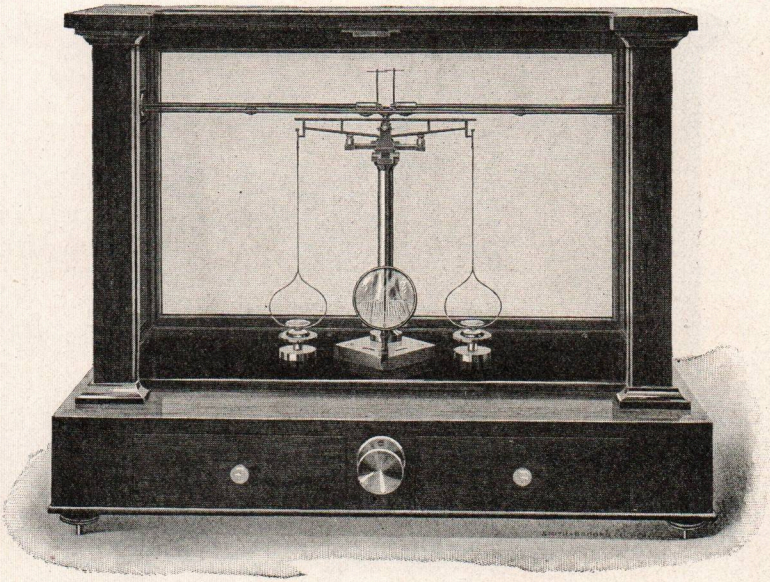
4032B Similar in construction to Type FB, except in length of beam and unit base, which it does not have.

Dimensions, weights, etc., same as Type FB.

Price $175.00

BALANCES

AINSWORTH'S



No. 4033A

TYPE H ASSAY BALANCE

6-inch, 15.2 Cm., Beam. Sensitivity 1-100 Mg.
Period of oscillation 9 seconds.

4033A An excellent button balance for ordinary button weighing with all the latest improvements, including improved rider apparatus and fall-away pan-rests. Has agate edges and bearings and star-wheel adjustment.

The beam has 50 divisions each side of the center reading to 1-50 milligramme with a 1 milligramme rider, or to 1-100 milligramme with a ½ milligramme rider, and being unobstructed on the top, the rider may be placed at any point from 0 at the center to the last division, which is directly over the end edge and represents the full weight of the rider used.

Has French polished mahogany case of thoroughly seasoned mahogany, with counter-poised sliding door and plate-glass sub-base.

Dimensions, 20 x 17 x 10 inches.

Weight, net, 22 pounds. Packed, 50 pounds. Packed for export in zinc-lined case, 80 pounds (36 kilos). Cubic measurement, 7.5 feet.

Dimensions, 28 x 22 x 16 inches, packed.

Price $135.00

No. 4033B

TYPE I ASSAY BALANCE

8-inch Beam. Sensibility 1-50 (.02) Mg.

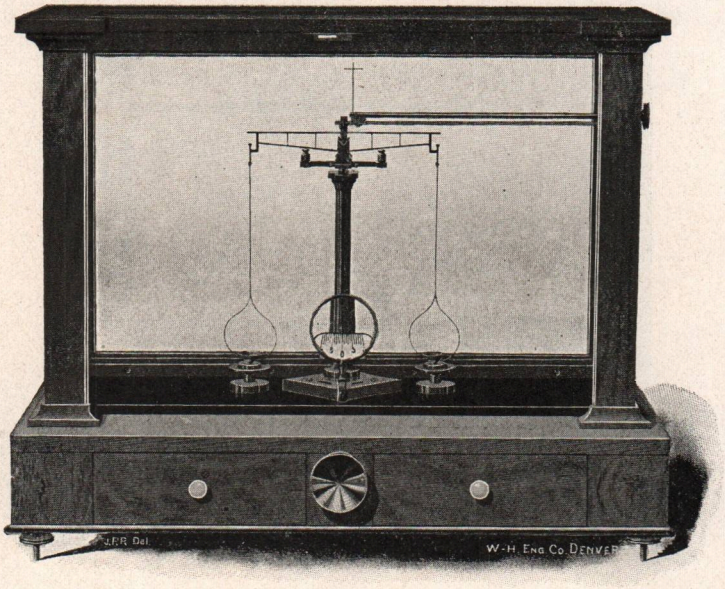
4033B Same as Type H, described above, only slower, owing to the difference in length of beam (2 inches).

Dimensions, weights, etc., same as Type H.

Price $125.00

BALANCES

AINSWORTH'S



No. 4034A

TYPE J ASSAY BALANCE

6-inch, 15.2 Cm., Beam. Sensitivity 1-100 Mg.

4034A This balance is similar to Type H, excepting the beam, which is graduated and provided with rider apparatus on right hand side only and adjusted to a sensibility of 1-50 milligramme. Has latest improved rider apparatus, agate bearings and edges, plate-glass sub-base, fall-away pan-rests, etc. In French polished mahogany case, with counter-poised sliding door.

Dimensions, 20 x 17 x 10 inches.

Weight, net, 22 pounds. Packed, 50 pounds. Packed for export in zinc-lined case, 80 pounds (36 kilos). Cubic measurement, 7.5 feet.

Dimensions, 28 x 22 x 16 inches, packed.

Price $125.00

No. 4034B

TYPE K ASSAY BALANCE

8-inch. Sensibility 1-50 (.02) Mg.

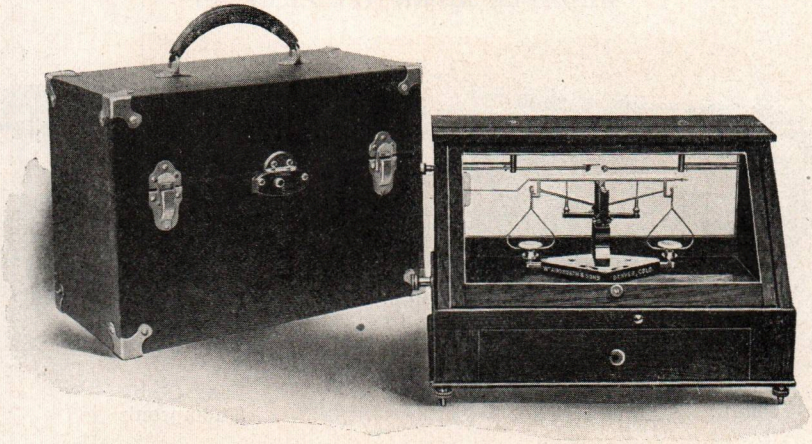
4034B Same as Type J, described above, only slower, owing to the difference in length of beam (2 inches).

Dimensions, weights, etc., same as Type J.

Price $115.00

BALANCES

AINSWORTH'S

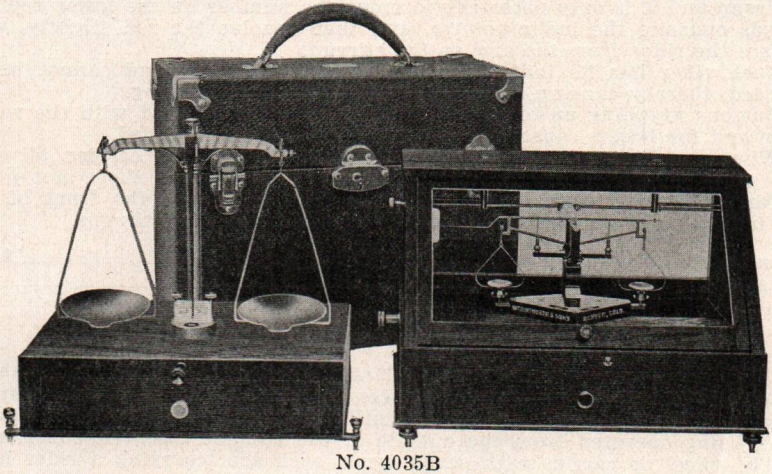


No. 4035A

PORTABLE ASSAY BALANCE, TYPE RA

5-inch Beam. Sensibility 1-100 Mg.

4035A A compact and accurate balance with agate edges and bearings, fall-away pan-rests, levels and leveling screws, double rider carrier and locking device, holding beam rigidly in position during transportation. Case of mahogany, French polished, with sliding door and lock for locking at any point.
Price, with Leatherette Carrying Case, as shown.....$95.00



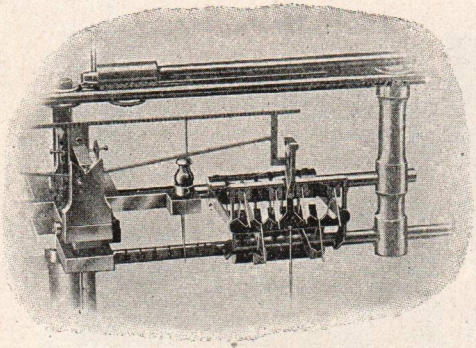
No. 4035B

PORTABLE OUTFIT, TYPES RA AND N

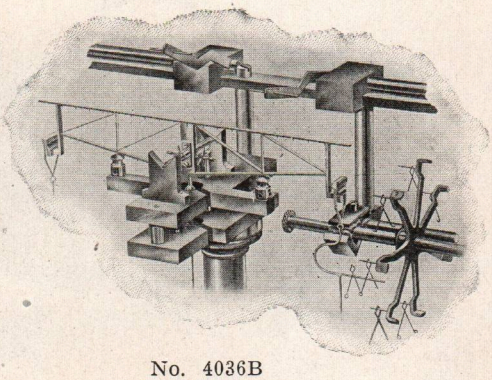
Comprising Type RA, as above, and Type N Pulp Balance (sensibility 1 Mg.).
4035B This makes a very compact and convenient outfit, both balances together with the weights carried in a single carrying case as shown.
Price, with Leatherette Case, as shown.....$110.00

BALANCES

MULTIPLE RIDER ATTACHMENTS



No. 4036A
Ainsworth's



No. 4036B
Thompson's

AINSWORTH'S IMPROVED MULTIPLE RIDER

4036A The above illustration shows Ainsworth's Improved Multiple Rider Carrier, as adapted to button balances, for weighing without the use of the ordinary weights as used in the pan.

The riders maintain their original accuracy even after months of constant use, and not being subjected to the continual handling with tweezers, do not become bent or broken.

Each rider is carried on a separate arm a short distance above the bar on the stirrup and it is only necessary to move the number on the lower rod until it stands opposite the index pointer, and then revolve the rod slightly, which transfers the rider from the arm to the stirrup.

Each rider has its individual arm for manipulating and cannot become misplaced, thereby causing an error in the following weighing.

Buttons weighing up to 42 milligrammes can be weighed with the regular carrier and for larger capacities additional arms may be added.

When weighing a button at or near the capacity of the carrier, all of the riders may be shifted to the stirrup simultaneously, and those not needed transferred back to their respective arms. The figures on the front of arms down indicating the combined weight of the riders on the stirrups.

Price attached to new balance when ordered.....$40.00
Price attached to old balance..... 45.00

THOMPSON'S MULTIPLE RIDER ATTACHMENT

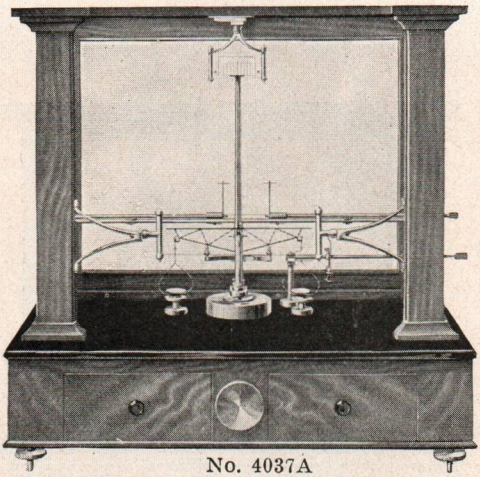
4036B This attachment and the riders used in connection with it take the place of all flat weights on button balances for weighing up to 72 milligrammes, and on analytical balances up to 720 milligrammes. The attachment is very simple, being operated from the outside of the balance case. It consists of a movable wheel or carrier with seven arms, each arm carrying a rider of different weight.

On button balances the riders used are 1, 2, 3, 5, 10, 20 and 30 milligrammes, and on analytical balances 10, 20, 30, 50, 100, 200 and 300 milligrammes. The end of each rider is formed to indicate its weight.

Price if attached to new balance or old Thompson balance.....$25.00
Price if attached to other makes..... 30.00

BALANCES

THOMPSON'S



No. 4037A

BUTTON BALANCE, STYLE No. 5

5-inch Beam. Sensibility 1-500 Mg.

4037A This balance is designed and built for the most delicate weighing, and has advantages of superior durability and extreme accuracy. It is of the non-column type, with upright pointer. This principle of construction gives plenty of room for a long pointer, plainly indicating the slightest movement of the beam and greatly reducing the length and weight of hangers, thereby tending to concentrate the movable mass near its central axis, and so creating the greatest possible stability of poise with the least possible resistance to the most minute load in the pan.

The scientific construction of the beam will appeal to the engineer. It is of the truss type and is so constructed that all trusses are in tension, the lower chord alone being in compression.

Special attention is called to the fact that the graduations are on the beam. In this balance we use an etching process, which in no way affects the density of the metal, and the readings being taken direct from the position of the rider on the beam, there is no possibility of error through any difference between the relative position of the rider and the graduations.

The agate edges and bearings are of the finest quality and workmanship, and in this balance we spare no time or expense in bringing the various adjustments to the highest point of perfection.

The rider apparatus, having fine felt bearings in contact with polished metal surfaces, gives a smooth and noiseless action, and is very sensitive to the touch.

The balance has a star wheel balancing device, skeleton hangers, fall,away pan-rests, rider rod locks, levels and leveling screws. The beam and index are provided with special ground cylindrical reading glasses, and all exposed metal parts are gold plated.

The case is of mahogany, thoroughly seasoned and finely polished, and has counter-poised door. A black glass-plate extends over the entire base.

Dimensions of case, 16½ x 17 x 10 inches.

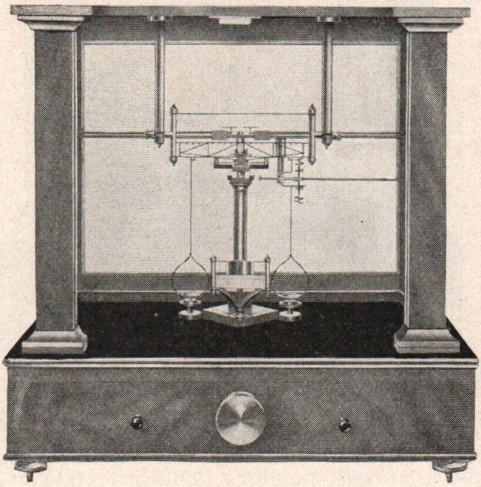
PRICE

Balance	$300.00
Multiple Rider Attachment, extra	25.00
Cylindrical Reading Glass for beam, extra	25.00

In ordering, state whether or not attachment or reading glass for beam are wanted.

BALANCES

THOMPSON'S



No. 4038A

BUTTON BALANCE, No. 6

4-inch Beam. Sensibility 1-400 Mg.

4038A We recommend this balance for work requiring extreme accuracy, such as control and umpire assays. It is quick and positive in action and has a stability of poise that will insure uniform and reliable results. Edges and bearings are of selected agate ground and polished with the greatest care.

The balance has improved rider apparatus, star wheel balancing device, specially ground reading glasses for beam and index, skeleton hangers, fall-away pan-rests, rider rod lock, levels and leveling screws.

The case is of thoroughly seasoned mahogany, with counter-poised sliding door. It is finely polished and has a black plate-glass which extends over the entire base.

Size of case, 16½ x 17 x 10 inches.

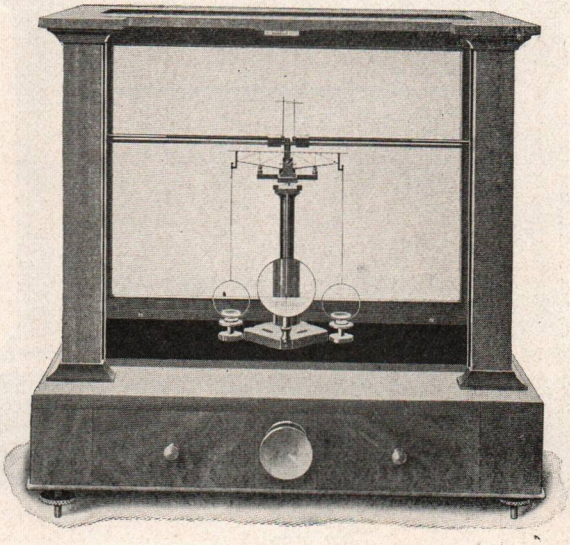
PRICE

Balance	$275.00
Multiple Rider Attachment, extra	25.00
Cylindrical Reading Glass for Beam, extra	25.00

In ordering, state whether or not attachment or reading glass for beam are wanted.

BALANCES

THOMPSON'S



No. 4039A

BUTTON BALANCE. STYLE NO. 9.

Four-inch Beam. Sensibility 1/200 Milligram.

4039A Has agate edges and bearings, truss beam with pin graduations, double rider attachment, fall-away pan rests, star-wheel balancing device, skeleton hangers, rider-rod lock, reading glass for index.

Mahogany case, with base glass, levels and leveling screws.
Dimensions, 16½ x 17 x 10 inches.

PRICE

Balance	$225.00
Multiple Rider Attachment, extra	25.00
Cylindrical Reading Glass for Beam, extra	25.00

In ordering, state whether or not attachment or reading glass for beam are wanted.

BUTTON BALANCE. STYLE NO. 10.

Four-inch Beam. Sensibility 1/200 Milligram.

4039B Same in all respects as Style No. 9, excepting that the beam for this balance is of the plain type, without braces or pin graduations.

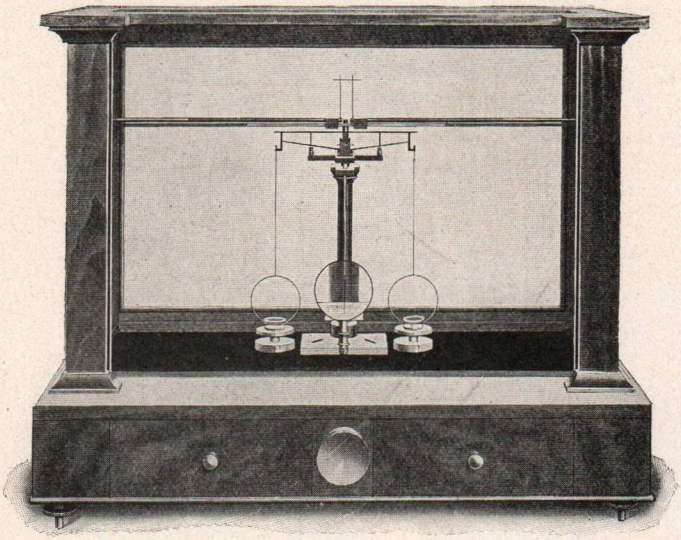
PRICE

as illustrated and described	$200.00
Multiple Rider Attachment, extra	25.00
Cylindrical Reading Glass for Beam, extra	25.00

In ordering, state whether or not attachment or reading glass for beam are wanted.

BALANCES

THOMPSON'S



No. 4040A

BUTTON BALANCE, STYLE No. 19

5-inch Beam. Sensibility 1-100 Mg.

4040A Agate edges and bearings, double rider attachment, fall-away pan rests, star-wheeled balancing device, skeleton hangers, reading glass for index, rider-rod lock, levels and leveling screws.

Case is polished mahogany, with base glass.

Dimensions, 20 x 17 x 10 inches.

PRICE

as illistrated and described.....$160.00
Multiple Rider Attachment, extra..... 25.00
Cylindrical Reading Glass for Beam, extra..... 25.00

In ordering, state whether or not attachment or reading glass for beam are wanted.

BUTTON BALANCE, STYLE No. 20

Six-inch Beam. Sensibility 1-100 Mg.

4040B Has agate edges and bearings, double-rider attachments, star-wheel balancing device, skeleton hangers, fall-away pan rests, rider-rod lock, reading glass for index.

Case is polished mahogany, with counterpoised door and base glass.

Dimensions, 20 x 17 x 10 inches.

PRICE

as illustrated and described.....$135.00
Multiple Rider Attachment, extra..... 25.00

In ordering, state whether or not attachment or reading glass for beam are wanted.

BUTTON BALANCE, STYLE No. 21

Six-inch Beam. Sensibility 1-100 Mg.

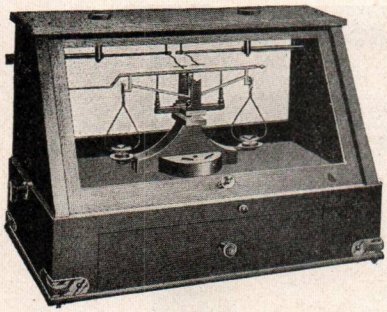
4040C Same in all respects as Style No. 20, except has no base glass.

PRICE

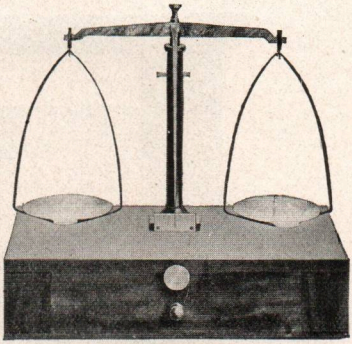
as described.....$125.00
Multiple Rider Attachment, extra..... 25.00

BALANCES

THOMPSON'S PORTABLE BALANCE OUTFIT



No. 4041A
5-inch Beam
Sensibility 1-100 Milligramme
Style No. 24



No. 4041C
7-inch Beam
Sensibility 1 Milligramme
Style No. 37

4041A This outfit consists of button balance, Style No. 24, and pulp balance, Style No. 37, together in one carrying case. Dimensions of carrying case, 13 x 12 x 7½ inches.
Price $108.00

4041D

COMPLETE PORTABLE BALANCE OUTFIT, STYLE No. 27

5-inch Beam. Sensibility 1-100 Mg.

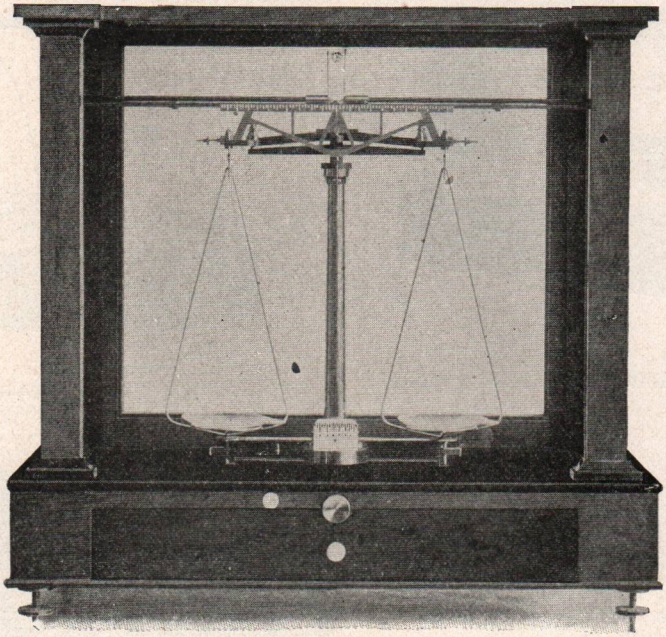
4041B Has double rider attachment, agate edges and bearings, fall-away pan-rests, levels and leveling screws. Polished mahogany case with sliding door, which can be fastened at any point by turning the knob. By simply pressing a button the beam is locked in place for transport.
Price $85.00

7-inch Beam. Sensibility 1 Mg.

4041C On mahogany base with drawer in which the column, beam, hangers and pans can be packed for convenience in shipping. Pans 3 inches in diameter. Dimensions, 6 x 11 x 2⅝ inches.
Price $15.00

4041D Carrying Case.
Carrying Case for one or both Balances, extra..... 8.00

BALANCES
AINSWORTH'S



No. 4042A

TYPE Q ANALYTICAL BALANCE

7-inch Beam. Sensibility 1-20 Mg.

Capacity, 200 Grammes

4042A An analytical balance of precision with hard rolled nickel aluminum beam, agate edges and bearings, double rider apparatus of improved construction, skeleton hangers.

Has two level vials set in base, extension glass sub-base covering entire top of base; all metal work gold-plated except the center bearings and drop levers. Drop levers swing from center coincident with contact line of center edge and release all contacts with the edges when loading the balance.

Has finely polished French mahogany case with counterpoised sliding door in front and removable sliding door in back.

In the engraving the front door has been removed to better illustrate the balance.

Dimensions of case, 20 x 20 x 10 inches.

Price $150.00

TYPE T ANALYTICAL BALANCE

With Multiple Rider Carrier.

6-inch. 15. Cm., Beam. Sensitivity 1-20 Mg.

Capacity 200 grams.

Capacity of Carrier, 1,215 Mg.

4042B Same as Type Q, as described on preceding pages, but with 6-inch 15.2 Cm., beam.

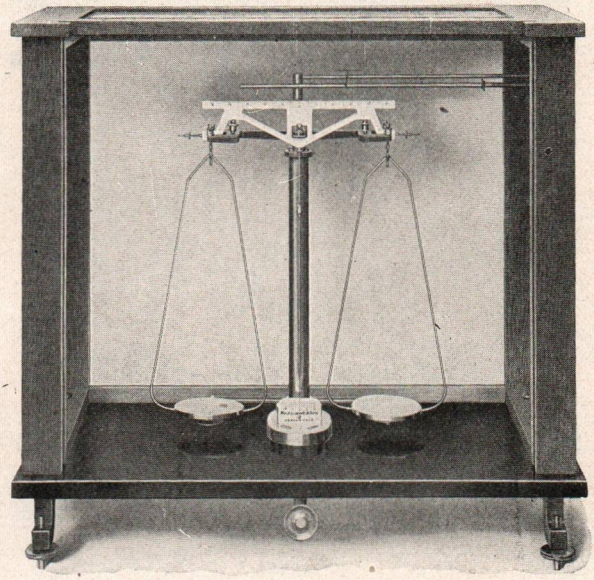
Price, with Multiple Rider Carrier as shown $200.00

Price, without Multiple Rider Carrier 150.00

Price, adjusted to 1-50 Mg. sensitivity, extra 15.00

BALANCES

AINSWORTH'S



No. 4043A

TYPE LJ ANALYTICAL BALANCE

Capacity 200 grams. Sensitivity 1-10 Mg.

4043A The beam is 6 inches, 15.2 Cr., long, divided both sides of the center and provided with double rider carried.

Finish—All metal work lacquered.

Edges and bearings are of agate, all contacts being released when the balance is at rest.

The base is of heavy black Carrara glass, which maintains the alignment of the mechanism under all atmospheric and climatic conditions.

The case is of mahogany French polished with counterpoised sliding door and four leveling screws.

Dimensions of case, 20 x 18 x 9 inches, 50 x 45 x 23 cm.; packed, 28 x 26 x 18 inches, 71 x 66 x 45 cm.

Weight, net, 20 lbs. (9 kilos); packed, 45 lbs. (20 kilos); packed in zinc-lined case for export, 70 lbs. (32 kilos). Cubic measurement, 8 feet.

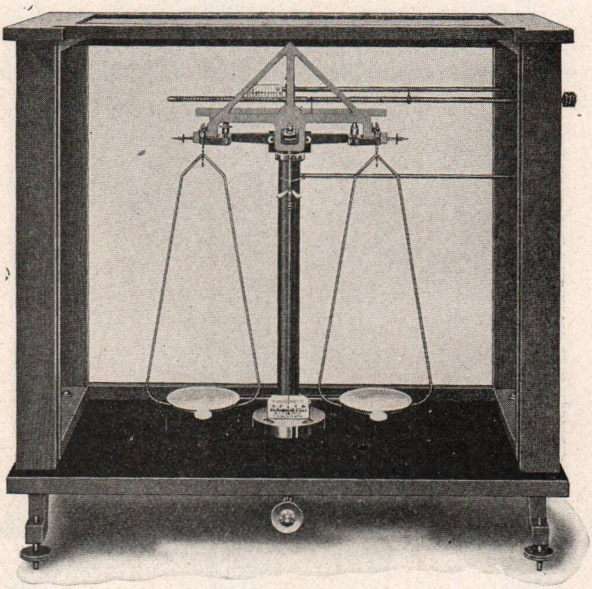
Price $70.00

TYPE LL ANALYTICAL BALANCE

4043B Same as Type LJ, but with metal work gold plated.

Price $80.00

BALANCES
AINSWORTH'S



N. 4044A

TYPE LM ANALYTICAL BALANCE

Capacity 200 grams. Sensitivity 1-10 Mg.

4044A Beam, 6 inches, 25.2 Cm., long, of triangular shape, affording maximum rigidity.

Finish, metal work heavily gold plated.

Otherwise as Type LJ.

Price, without Vernier Rider Carrier and Variable Sinsitivity attachment..$95.00
Price, Vernier Rider Carrier, extra..... 15.00

VARIABLE SENSITIVITY ATTACHMENT

For rapid weighing we recommend the use of our variable sensitivity attachment as above shown, which consists of a heavy rider on a carrier operated from the right hand end of the case, which may be placed on a projection attached to the painter, thereby reducing the sensitivity to 1-10th or 1-20th (as desired), the rated sensitivity of the balance and increasing the speed of oscillation correspondingly.

After a weighing is made roughly to the nearest milligram, the sensitivity rider is raised and the weighing finished at the maximum sensitivity of the balance.

The sensitivity may be changed instantly with the beam in motion, thereby effecting a great reduction in the time required for a given weighing.

Price, attached $7.50

TYPE LH ANALYTICAL BALANCE

4044B As above described, but with:

Beam divided on one side and having single rider carrier only.

Finish, a durable black enamel.

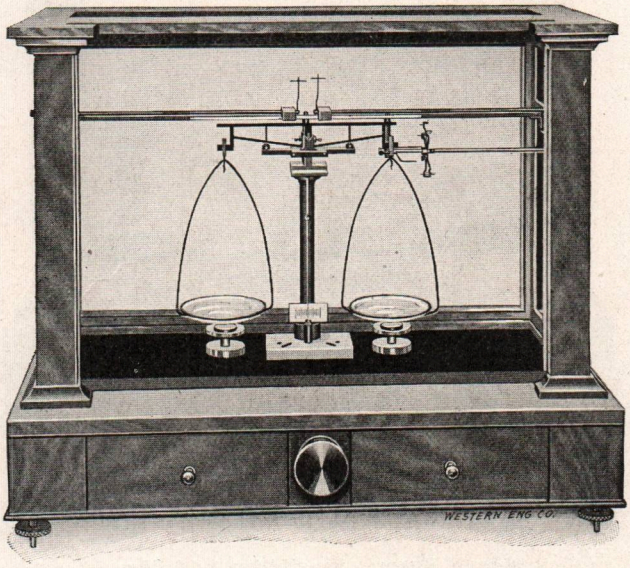
Base of black slate.

Otherwise as described on preceding page.

Price $55.00

BALANCES

THOMPSON'S



No. 4045A

ANALYTICAL BALANCE, STYLE No. 28

6-inch Beam. Sensibility 1-20 Mg.

Capacity, 200 Grammes in each pan.

4045A With this balance all weights below ½ gramme are manipulated from outside of the case by means of the multiple rider attachment. The balance has agate edges and bearings, star-wheel balancing device, skeleton hangers, rider-rod lock, levels and leveling screws.

Polished mahogany case with counterpoised door and glass base.

Dimensions, 20 x 10 x 17 inches.

Price, without Multiple Rider attachment.....$110.00
Price, Multiple Rider Attachment, extra..... 25.00

In ordering, state whether or not attachment is wanted.

ANALYTICAL BALANCE, STYLE No. 29

6-inch Beam. Sensibility 1-20 Mg.

Capacity, 200 Grammes in each pan.

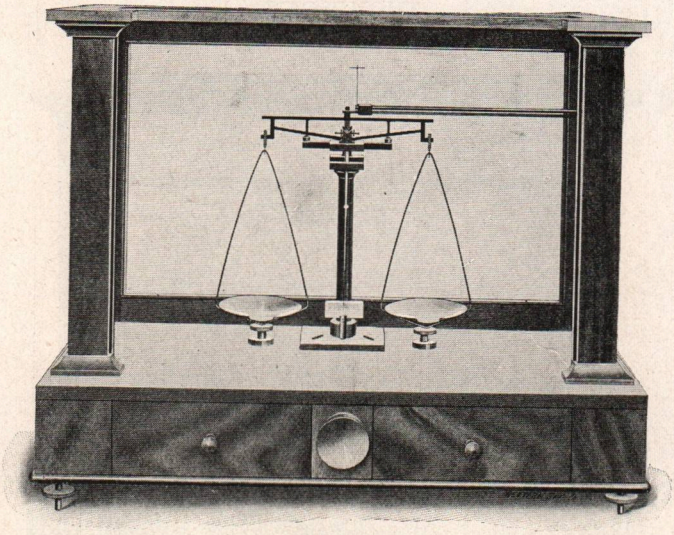
4045B Has agate edges and bearings, star-wheel balancing device, double rider attachment, skeleton hangers, three-inch glass pans, fall-away pan-rests, rider-rod lock, levels and leveling screws. Polished mahogany case with counterpoise door.

Dimensions, 20 x 17 x 10 inches.

Price, as illustrated and described.....$100.00
Price, Multiple Rider Attachment, extra..... 25.00

In ordering, state whether or not attachment is wanted.

BALANCES AND BALANCE COVERS



No. 4046A

THOMPSON'S CHEMICAL BALANCE, STYLE No. 31

6-inch Beam. Sensibility 1-10 Mg.

4046A This balance has single rider attachment, steel knife edges and agate bearings, three-inch metal pans, fall-away pan rests, levels and leveling screws, mahogany case with counterpoised door.

Dimensions, 20 x 17 x 10 inches.

Price $65.00

DUST-PROOF COVERS

4046B Every balance should be protected by a cover when not in use.

Our covers are made of the best rubber sheeting and are, therefore, dust and moisture-proof. By keeping the balance covered when not in use, much unnecessary brushing and cleaning will be avoided; and as many accidents occur during the operation of cleaning, one of these covers will save many times its cost in repair bills as well as keep the balance in a bright condition.

In ordering, give exact length and width of top of case; also extreme height. (We make all allowances for easy fit.)

Price, for our own Balances ..... each, $2.00

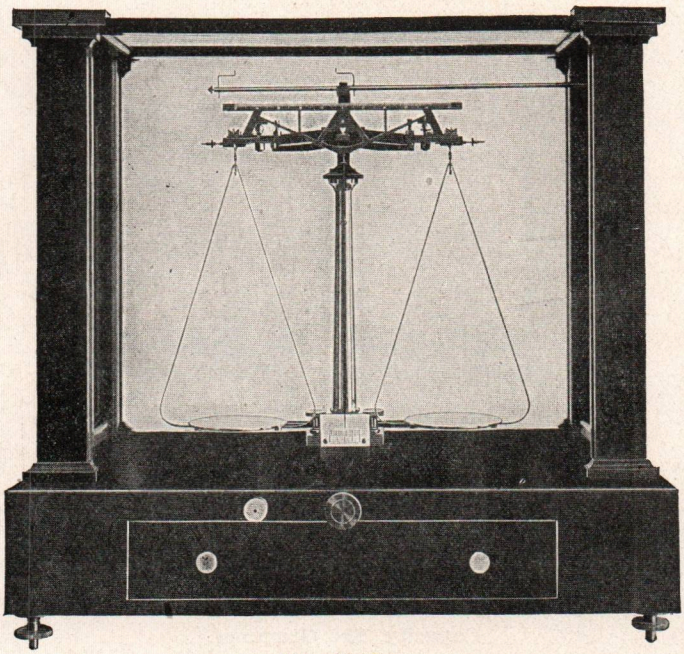
Price, Specials to order in sizes not over 18 in. high, 21 in. long ..... each, 2.00

Specials to order in sizes larger than above on application.

Covers sent by mail; postage, according to size, 12c to 20c.

BALANCES—TROEMNER'S

ANALYTICAL BALANCE



No. 4047A

Beam, 7 inch (17.7 cm.). Sensibility, 1-20 (.05) milligram.
Capacity, 200 grams (8 ounces).

4047A The above illustrates our world-famous high-grade analytical balance of popular capacity. The design, construction and finish are original with us. As this balance is being copied by other makers, we would ask our clients to refuse all balances without our name, as there are counterfeits possessing all the worthless character of such creations.

Beam is made of cold rolled aluminum alloy having more than three times the tensile strength of pure aluminum, and being rolled (NOT CAST) under high pressure rolls, all the invisible defects in the mass are eliminated and a great uniform density is secured throughout the sheet. From this sheet the beam is "jigged," and this gives to the finished beam great stability, so that it will maintain its adjustment over a wide range of temperature changes. The beam is then oxidized black with a non-corrosive preparation and divided into fifty parts each side of the centre-knife. These divisions, for legibility, are white. The beam is unobstructed on the top and the rider can be placed at any point.

Edges and Planes are of genuine selected Russian agate, ground with great accuracy and care to meet the requirements of the work successfully and give to the balance when in operation that steady and free action that alone is to be found in our original product. The knives are set rigidly in the beam, as this method is far superior to screws, for they will stand harder usage and protect the adjustment.

In the base of the column are let two sensitive vial-shaped levels that are guaranteed not to leak, as is the common complaint where the other styles of levels are used.

Case is of old, well-seasoned mahogany, French polished; the top of base is covered with a black plate glass; the front sash is counterpoised, opening up the full width of the case; the rear sash also slides up, allowing the weighing of long subjects extending beyond the outside lines of the case; the top and ends are also fitted with glass sash, thus securing plenty of light from all directions. Size, 19 inches long, 19 high, 11 deep (48x48x28 cm.).

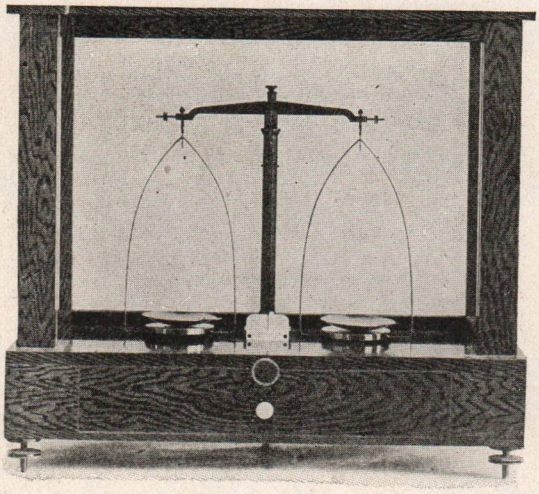
Finish. All the brass parts are gold-plated.

PRICE

Type 10 ..... $162.50

BALANCES

AINSWORTH'S



No. 4048A

TYPE M, PULP BALANCE

6-inch Beam. Sensibility ½ Mg.

Capacity, 200 Grammes.

4048A Has agate bearings, pan-rests, level and leveling screws, and is ordinarily furnished with 2½-inch pans, but 3-inch pans will be furnished when specified.

Has French polished mahogany case with counterpoised sliding door.

Dimensions, 17 x 15 x 8 inches. Packed, 26 x 15 x 20 inches.

In the engraving the counterpoised sliding door has been removed to better illustrate the balance.

Weight, net, 10 pounds (4.5 kilos). Packed, 30 pounds (13.6 kilos). Packed for export in zinc-lined case, 50 pounds (22 kilos). Cubic measurement, 4.5 feet.

Price $35.00

TYPE MA, PULP BALANCE

4048B Same as Type M, but with agate edges.

Price $42.50

TYPE N, PULP BALANCE

6-inch Beam. Sensibility 1 Mg.

Capacity, 200 Grammes.

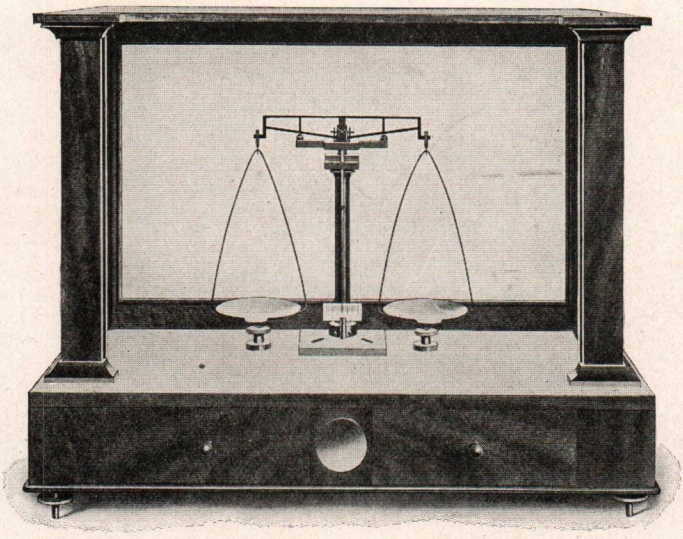
4048C Similar to Type M, in general construction; without glass case, but mounted on polished mahogany base, into the drawer of which the beam, column, hangers and pans pack for carrying; has 2½-inch pans.

Dimensions of case, 12 x 6 x 3 inches.

Price $17.50

BALANCES

THOMPSON'S



No. 4049A

PULP BALANCE, STYLE No. 33

6-inch Beam. Sensibility 1-10 Mg.

4049A Has steel edges and agate bearings, fall-away pan-rests, 3-inch metal pans. Mahogany case with counterpoised door.

Dimensions, 20 x 10 x 17 inches.
Price $55.00

PULP BALANCE, STYLE No. 36

7-inch Beam. Sensibility ¼ Mg.

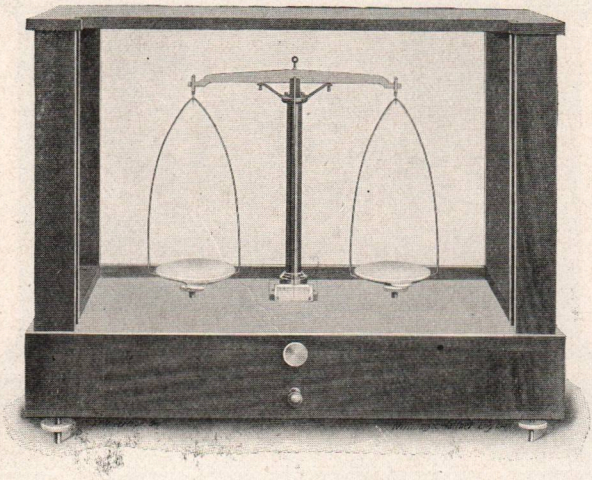
4049B Similar to Style No. 35, but has no arms to present beam from falling off when one hanger is removed, and center edge is not raised off bearing when balance is not in use.

Has steel edges and agate bearings, adjustable pan rests, skeleton hangers, three-inch pans, level and leveling screws. Mahogany case, with counterpoise door.

Dimensions, 17½ x 8 x 15 inches.
Price $32.50

BALANCES.

THOMPSON'S



No. 4050A

PULP BALANCE, STYLE No. 35

7-inch Beam. Sensibility ¼ Mg.

4050A Special attention is called to the construction of the center bearings in this balance. It is an agate plane, instead of a groove as in most balances of this class, the advantage being that the contact with the knife edge can be easily kept clean, and when the balance is not in use, the knife edge does not rest on the bearing. In all pulp balances that have a grooved center bearing it is necessary to have a plate cover each end of the groove in order to keep the beam in place. This forms a corner in which the dust from the pulp collects, surrounding the knife edge, and preventing free oscillation.

The balance has steel edges and agate bearings, adjustable pan-rests, three-inch metal pans, fly balancing device, level and leveling screws. Mahogany case with counterpoised door. Dimensions, 17½ x 8 x 15 inches.
Price $38.00

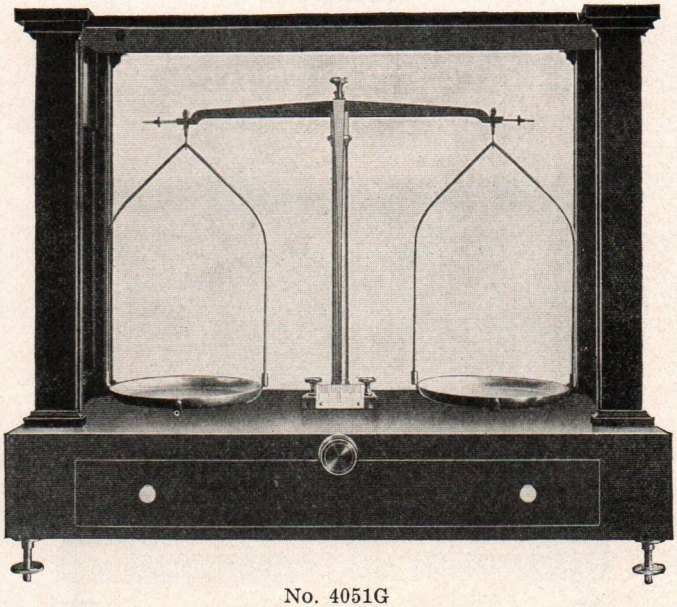
PULP BALANCE, STYLE No. 37

7-inch Beam. Sensibility 1 Mg.

4050B Mounted on polished mahogany base, without glass case, but has drawer in which the column, beam, hangers and pans can be packed for convenience in shipping. Fly adjustment. Pans 3 inches in diameter.

Dimensions, 6 x 11 x 2⅝ inches.
Price $15.00

PULP BALANCES



No. 4051G

TROEMNERS TYPE 222

Mounted on mahogany box, with drawer, into which the whole balance packs away for transportation. Made with both steel and agate bearings.

	Type	Capacity.	Sensibility.	Dia. Pans.	Length. Beam.	Price. Steel Bearings.	Price. Agate Bearings.
4051A	2223	2 oz.= 62.207 gm.	.0154 gr.=1 mg.	3″	6″	$13.00	.....
4051B	2243	2 oz.= 62.207 gm.	.0154 gr.=1 mg.	3″	6″	.....	$14.50
4051C	2224	5 oz.=155.517 gm.	.0308 gr.=2 mg.	3.5″	8″	18.25	.....
4051D	2244	5 oz.=155.517 gm.	.0308 gr.=2 mg.	3.5″	8″	.....	19.50
4051E	2225	10 oz.=311.035 gm.	.0770 gr.=5 mg.	4″	9″	27.50	.....
4051F	2245	10 oz.=311.035 gm.	.0770 gr.=5 mg.	4″	9″	.....	28.75

BALANCE, TYPE 25

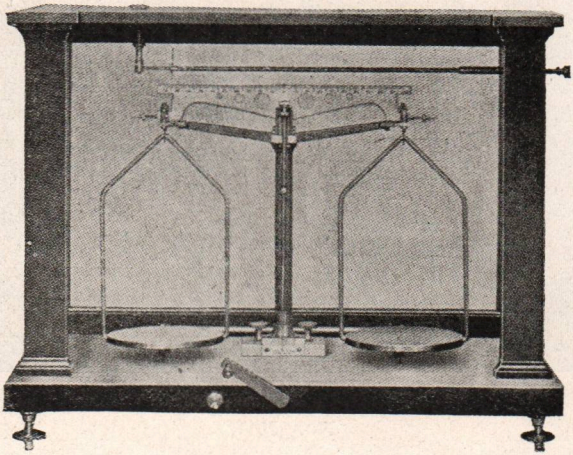
This is the same balance as Type 222, except they are fitted into mahogany glass cases, with counterpoised front door and drawer in base, screw leveling feet and level.

	Type	Same Specifications as	Price Steel Bearings	Price Agate Bearings
4051G	254	No. 2223	$26.00	.....
4051H	2503	No. 2243	.....	$28.75
4051I	253	No. 2224	31.25	.....
4051J	2504	No. 2244	.....	34.00
4051K	252	No. 2225	43.00	.....
4051L	2505	No. 2245	.....	45.50

BALANCES

TROEMNER'S

DEMONSTRATION BALANCE



No. 4052A

TECHNICAL ANALYTICAL BALANCE. designed for ordinary analytical work, etc., and fo rexact weighings on the lecture table and the small size for students' use. Agate knives and bearings.

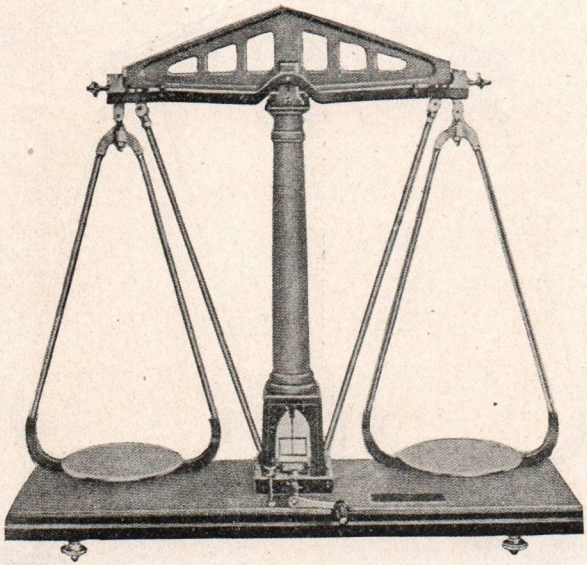
The balance is mounted in a mahogany and glass case, with sliding front sash, which is counterpoised; screw leveling feet and level. Hook on end of hanger for specific gravity weighing. Beam is graduated both sides of center into 100 divisions.

Made in six sizes, as follows:

	Type.	Capacity Grams.	Sensibility.	Length Beam.	Diameter Pans.	Clearance Inside of Bows.	Price.
4052A	2376	100	0.5 mg.	6″	3″	7x3⅛″	$ 45.50
4052B	2377	200	1.0 mg.	8″	3.5″	9x3¾″	50.75
4052C	2378	500	1.5 mg.	9″	4″	11x4⅛″	65.00
4052D	2379	1000	2.5 mg.	11″	5″	13x5⅛″	78.00
4052E	2780	2000	3.5 mg.	12″	6″	15x6⅛″	104.00
4052F	2781	5000	5.0 mg.	15″	7″	17x7⅛″	130.00

BULLION BALANCES

TROEMNER No. 175



No. 4053A

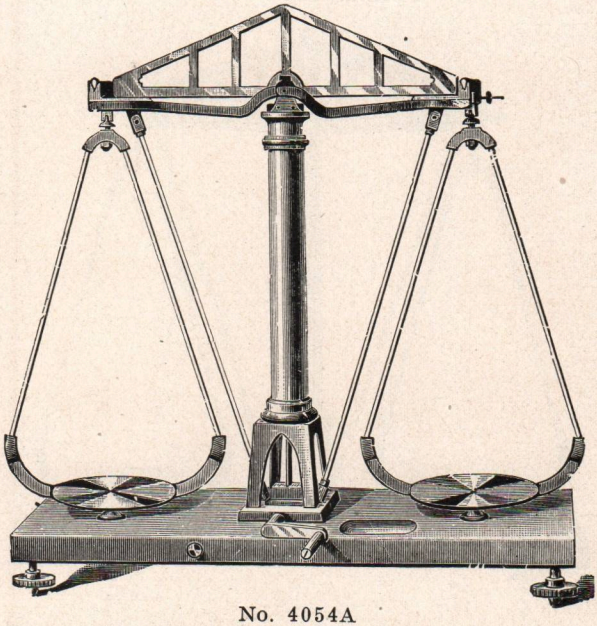
These balances are of the highest type of mechanical excellence. They are made in three sizes. The beam is of bronze. The column and base are of iron, neatly enameled. Fitted with adjustable screw feet and level. The needle works within the column, passing over an ivory index fitted in the base of the column. The arches and pans are of brass. Fall-away beam support and push-button pan arrest, steel knife-edges and bearings. The price does not include weights.

Balances types 176, 1751 and 175, with agate plane bearings prices on application.

	Type	Capacity	Sensibility	Length of Beams	Dia. of Plates	Width of Bows	Size of Base	Price	Price with Beam Case	Price in Case
4053A	1234A	1000 oz.	¾ grn.	12″	12″	12″	40x12⅛″	$123.90	$123.00	$123.00
4053A	176	500 oz.	1 grn.	24″	8″	11″	40x11½″	$208.00	.....	.....
4053B	176A	500 oz.	1 grn.	24″	8″	11″	40x11½″	.....	$240.50	.....
4053C	176B	500 oz.	½ grn.	24″	8″	11″	40x11½″	.....	.....	$325.00
4053D	1751	1000 oz.	2 grn.	27″	10″	16″	49x15″	260.00	.....	.....
4053E	1751A	1000 oz.	2 grn.	27″	10″	16″	49x15″	.....	299.00	.....
4053F	1751B	1000 oz.	1 grn.	27″	10″	16″	49x15″	.....	.....	377.00
4053G	175	2000 oz.	2 grn.	31″	11″	16″	49x15″	273.00	.....	.....
4053H	175A	2000 oz.	2 grn.	31″	11″	16″	49x15″	.....	312.00	.....
4053I	175B	2000 oz.	1 grn.	31″	11″	16″	49x15″	.....	.....	390.00
4053J	1755	3000 oz.	2 grn.	31″	11″	16″	49x15″	403.00	.....	.....
4053K	1755A	3000 oz.	2 grn.	31″	11″	16″	49x15″	.....	429.00	.....
4053L	1755B	3000 oz.	1 grn.	31″	11″	16″	49x15″	.....	.....	552.50

BULLION BALANCES

CHRISTIAN BECKER'S



No. 4054A

BULLION AND SPECIE SCALE, No. 29

4054A Carrying 500 ounces in each pan; sensible to ½ grain with its full charge. All bearings agate planes, with new improved construction for the arrestation of beam and pans. Provided with leveling screws and spirit level.
Price $225.00

BULLION AND SPECIE SCALE, No. 31

4054B Same as No. 29 Scale. For 2,000 ounces in each pan; sensible to 1 grain with its full charge.
Price $275.00

BULLION AND SPECIE SCALE, No. 33

4054C Same as No. 31 Scale. For 5,000 ounces in each pan; sensible to 2 grains with its full charge.
Price $650.00

BULLION AND SPECIE SCALE, No. 30

4054D In French polished mahogany glass case, with counterpoised front sliding frame. For 500 ounces in each pan; sensible to ½ grain with that charge. Provided with leveling screws and spirit level.
Price $315.00

BULLION AND SPECIE SCALE, No. 32

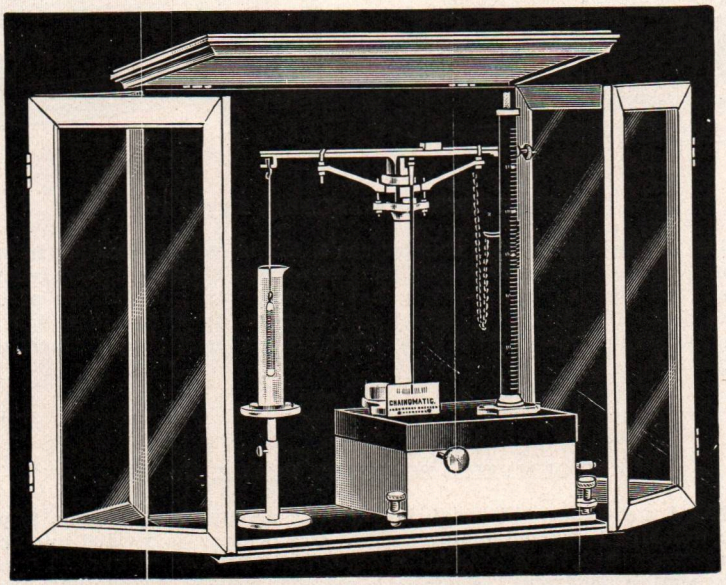
4054E Same a sNo. 30 Scale. For 2,000 ounces in each pan; sensible to 1 grain.
Price $375.00

BULLION AND SPECIE SCALE, No. 34

4054F Same as No. 30 Scale. For 5,000 ounces in each pan; sensible to 2 grains.
Price $825.00

SPECIFIC GRAVITY CHAINOMATIC BALANCE

FOR LIQUIDS



No. 4055A

4055A Specific Gravity Chainomatic balance has all the salient features of the Analytical Chainomatic Balance which so revolutionized weighing in Analytical Chemistry.

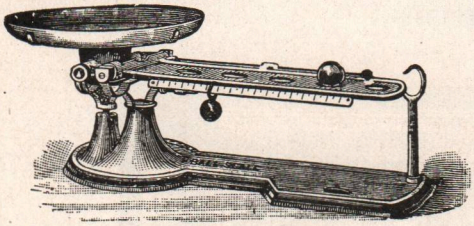
There are no riders or weights to use, all weighings or determinations are accomplished by adding weight to the beam by means of the chain, and with a resulting accuracy equal to the highest grade of Analytical Balance.

The plummet immersed in the liquid under test, the rotation of the handle placed at the right hand of base manipulates a spiral drive, raising or lowering the chain, one end of which is hung from the beam and the other end from a slide block which is moved up and down on a vertical graduated scale. This scale, provided with vernier, is graduated to give direct readings, in Specific Gravity to the third decimal place.

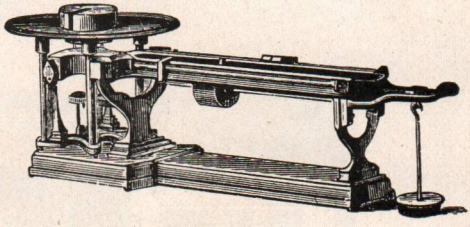
Case: Of special design, with glass front and glass sides adjustble, will reduce air disturbances to a minimum, at the same time insure freedom in operating the balance.

Price $100.00

SCALES



No. 4056A



No. 4056B

TROEMNER'S BALL SCALE, TYPE 124

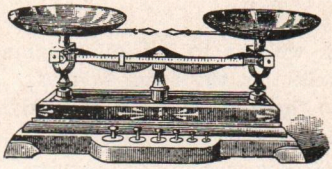
4056A A new and elegant counter scale, the latest modification in weighing apparatus. Scale has 10-inch nickel pan; has extra siding poise to balance bottles, etc.; will weigh from ¼-ounce to 16 pounds without the use of ordinary weights; elegantly finished in nickel and bronze. In every respect a perfect scale, and saves the cost of a set of weights. Diameter of pans, 10 inches; capacity, 16 pounds.

Price $21.00

TROEMNER'S SOLUTION SCALE, No. 80

4056B A scale that will weigh liquids with accuracy. The scale is provided with two weighing bems and sliding poises. One of these is divided into 100 parts, each part representing one gram; the other beam is divided into 10 parts, each part representing 100 grams. A bar with a sliding poise is placed under the weighing beam for the purpose of balancing the empty bottle or container. Capacity 20 kilos; sensibility 1 gram.

Price $38.50



No. 4056C

TROEMNER'S BULLION BALANCE, TYPE 189

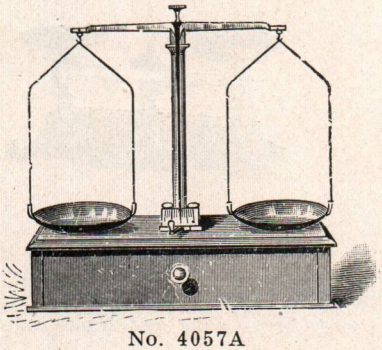
4056C With 6-inch nickel pans; all bearings are of agate, to insure the highest attainable sensibility with endurance.

Sliding beam on front, divided into pennyweights and grains, by which the exact weight of an article is quickly ascertained, thus doing away with small weights; a set of weights (12 oz.) is arranged on a platform on front of scale. Scale is sensitive to 1 grain.

Price $23.50

SCALES

TROEMNER'S U. S. MINT BULLION SCALES



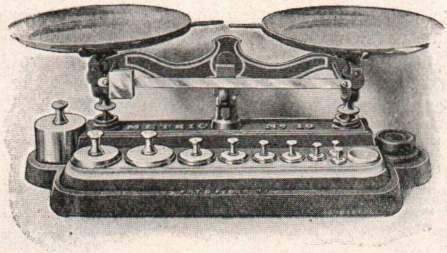
No. 4057A

4057A Indicator pointing downward; on a polished walnut box, with drawer.

Very accurately adjusted; a set of Troy cup weights, including pennyweights and grain weights, furnished with each scale.

Type	Beam	Diam. Pans	Capacity
0	13 in.	6	20 oz.
1	10 in.	5	10 oz.
2	9 in.	4	5 oz.
3	7 in.	3½	2 oz.
4	6½ in.	3	1 oz.

Price, No. 0 ..... $35.00
Price, No. 1 ..... 25.00
Price, No. 2 ..... 20.00
Price, No. 3 ..... 17.50
Price, No. 4 ..... 15.00



No. 4057B

METRIC SOLUTION SCALES

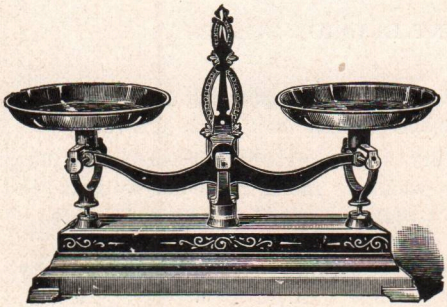
4057B An even balance for making rapidly raegents or any other kind of composite solutions.

The scale has two movable brass pans, and the weight rack is attached to the base of scale, and in it are fitted the weights ,which are made of solid brass. The scale is provided with a side beam in front, undivided, and is used for balancing the bottle or containers. With this scale can be made the most accurate solutions. Sensibility, ½ gramme.

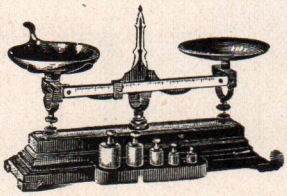
Type	Diam. of Pans	Capacity	Price
10	9 inches	5 kilos to 1 gramme	$28.00
8	5½ inches	1 kilo to 1 gramme	23.00

Note—We are prepared to quote prices for duty-free importation on all classes of goods for educational institutions.

SCALES



No. 4058A



No. 4058B

TROEMNER'S ROBERVAHL SCALE, TYPE 75

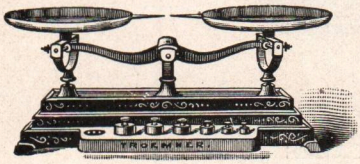
4058A Neatly ornamental in gold lines. Heavy brass pans and brass indicator.

Type	Size of Pan	Capacity	Price
2	9 in.	5 pounds	$12.50
3	8 in.	2 pounds	10.25
4	5½ in.	1 pound	9.00

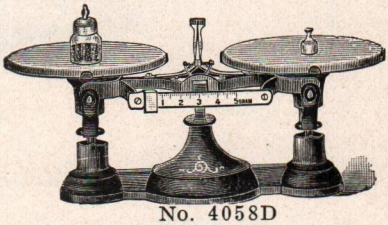
TROEMNER'S DISPENSING SCALE, TYPE 6D

4058B With side beam and sliding weight, to weigh 4 ounces. Handsomely finished; has 3¾-inch nickel-plated movable pans; a side beam in front of scale with a sliding weight; this beam is divided into 120 divisions, each division representing one grain; an extra row of metric divisions is placed on bottom edge of beam, each representing one decigramme. Platform or shelf is attached to base of scale, in which are fitted a set of solid brass Troy weights, 2 ounces and down. Sensible to 1 grain; capacity, 4 ounces.

Price $11.75



No. 4058C



No. 4058D

TROEMNER'S LABORATORY SCALE, TYPE 7

4058C Specially designed for laboratory and pharmaceutical work; has 6-inch movable nickel pans; will carry 1 lb. in each pan; sensible to 1 grain; with a full set of weights running from 8 ounces Troy and down to 1 grain neatly fitted in a projecting shelf attached to the base.

Price $13.00

4058D Troemner's Laboratory Scale No. 7, with Metric weights..... 13.00

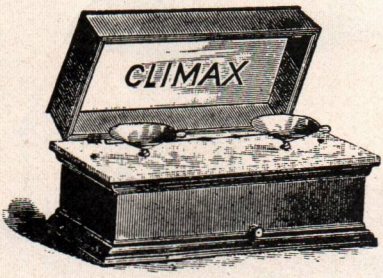
BALANCE, HARVARD TRIP, TYPE 436

4058E With two 6-inch round porcelain plates and side beam for laboratory work; capacity, 1 kilogramme to 1-10 gramme.

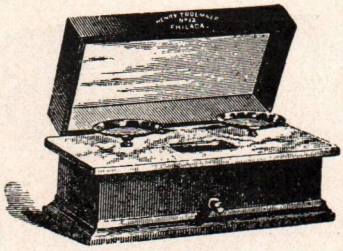
Price $9.75

SCALES

BOX PRESCRIPTION SCALES



No. 4059A



No. 4059B

CLIMAX BOX PRESCRIPTION SCALES, TYPE 120

4059A This scale has 2¾-inch, nickel-plated pans; cherry-mahogany box, white marble top; hinged glass. Top lid nickel-plated pans, screw leveling feet and level.
Price $19.00

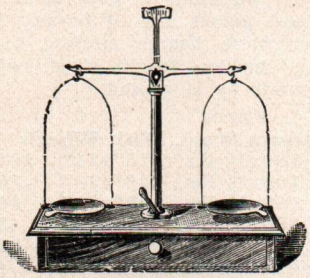
4059B The same as 470, with drawers for weights.
Price $20.25

BOX PRESCRIPTION SCALES, TYPE 12

4059C In French polished ebony box with marble top, which has countersunk basin in it to hold the weights; pans are of solid nickel; scale is sensible to 1-20 grain; has glass cover provided with stop-hinges, all of the finest workmanship, and one of the most popular scales we have ever handled. Used and sold in all parts of the world. To avoid corrosion and cleaning, no "metal" parts are put on the outside of box, excepting the pans and hinges.

Type	Capacity	Diam. of Pans	Sensibility	Price
12	½ oz.	3	1/20 gr.	$24.75
13	½ oz.	3¾	1/20 gr.	27.50

ARMY PRESCRIPTION SCALES, TYPE 9



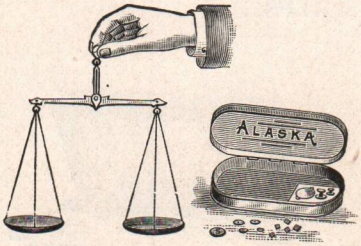
No. 4059C

4059D On polished walnut box; scale can be taken apart and packed away in drawer of box; a well-finished and reliable scale, made in a mechanical way; well adapted for physicians' offices; a full set of weights, 2 drachms to ½ grain included

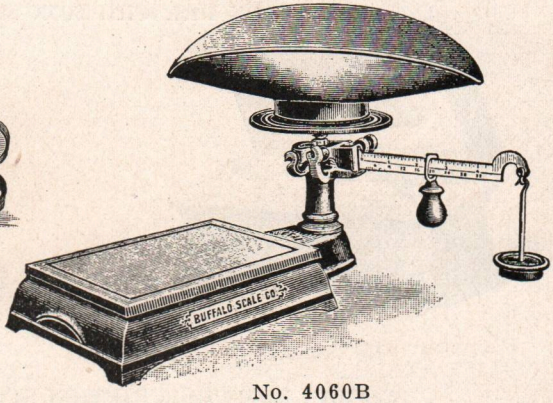
Type	Beam	Diam. of Pans
0	8	2¾
1	7	2½
2	5¾	2

Price, Type 0 ..... $8.00
Price, Type 1 ..... 6.50
Price, Type 2 ..... 4.50

POCKET, UNION AND PLATFORM SCALES



No. 4060A



No. 4060B

TYPE 350

4060A **MINER'S POCKET SCALES.** Made in three sizes, and strictly first class. They are put up in neat tin boxes, with oval ends, and enameled green with bronze stripes; entire scale is of brass, including deep brass pans, hung with brass chains; full set of accurate weights are included.

Capacity	oz.	½	2	4
Price	each	$2.75	3.25	4.00

4060B **EBONY BOX SCALES, No. 89.** In ebony box, gold lines; gilt dial; heavy nickel-plated pans; marble top.

No.		0	1	2
Diam. of pans	in.	7	8	9
Capacity	lbs.	5	8	10
Price	each	$18.25	21.00	23.50

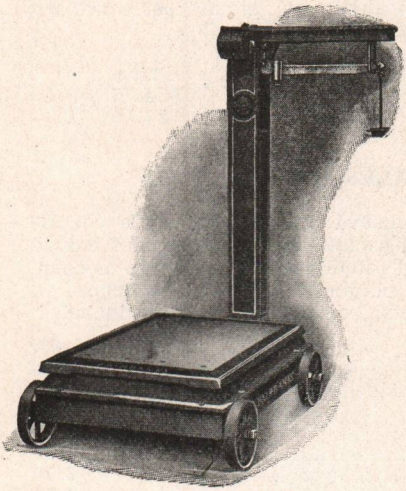
UNION SCALE

4060C With two platforms, especially convenient for a large variety of uses; capacity from ½ oz. to 30 pounds in the scoop, and to 240 pounds on the platform, which measures 10½ x 13½ inches.

Price, with tin scoop, each $18.00
Price, with brass scoop, each 20.00

PLATFORM SCALES
With Wheels

4060E Adapted for all kinds of general weighing. The beams and poises are of brass. The three smaller sizes have beams marked to 50 pounds by ¼ pound marks; larger sizes, beams are marked 100 pounds by ½ pound.



No. 4060E

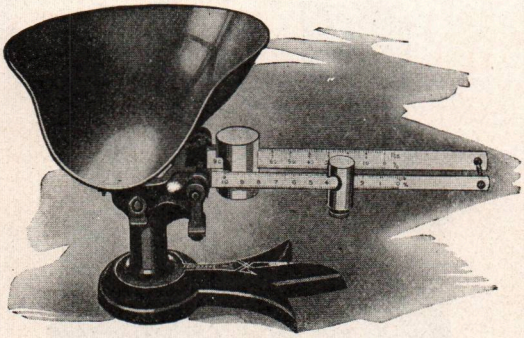
Prices

Portable Platform Scale, With Wheels

1116	2,500 lbs.	100x½ lbs.	25"x34"	$90.00
1118	2,000 lbs.	100x½ lbs.	25"x33"	80.00
1120	1,500 lbs.	100x½ lbs.	22"x31"	60.00
1124	1,000 lbs.	100x½ lbs.	18"x27"	43.00
1128	500 lbs.	50x¼ lbs.	16"x25"	33.00

Note—In the platform sizes above, the first figure is the dimension parallel with the beam.

SCALES



No. 4061A

MOISTURE SCALE, TYPE 266

4061A Used at smelting and similar plants for determining the percentage of moisture in ores, etc. The ordinary capacity scale is made to weigh a sample of 50 ounces, but special scales are manufactured to order, of other capacities as described below. The scale beam has two rows of graduation, the upper row giving the weight in ounces, or pounds, and fractions thereof; the lower row giving the percentages. The percentage row on all scales is figured 100 to 0 per cent, by 1 per cent, and thus the reading gives the direct percentage of loss. The given amount of ore is first weighed, then dried or roasted, and reweighed to note the loss of moisture or sulphur. From 50-oz, to ½-oz. capacity; 6-in. plates.
Each $15.00

BALANCE, NORMAL SUGAR SCALE, TYPE 9592

4061B Steel knife edges, agate bearings. A type of scale that is coming into rapid favor because, with it, results can be obtained to the fourth decimal place on the polariscope. The front beam is divided for 1-100 gram to 1 gram; the middle beam is threaded for balancing the cup, the back beam is divided on the bottom, for 1 gram to 60 grams, and on the top into ¼ normal weight (13.024 grams), normal weight double, and 2½ times normal weights. The operator is therefore in handy touch with all the factors for weighing sugar accurately and quickly for the polariscope charges. Base and posts are of iron.
Price $35.00

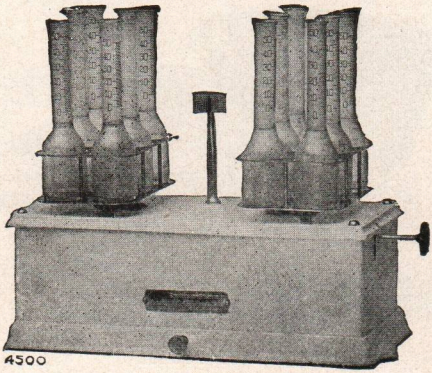
DETROIT AUTOMATIC SCALE, TYPE 40

4061C Direct reading and rapid. Where speed is important, one balance of this type will displace a number of others, as no weights of any kind need be handled. They have agate bearings and hardened steel pivots throughout, with oil dash pot for regulating sensitiveness. Capacity 2 lbs., 500 grams. Scale in 5 gram divisions.
Price $55.00

DETROIT AUTOMATIC SCALE, TYPE 410

4061D Capacity 3 lbs., 1,500 grams. Scale in 5 gram divisions.
Price $65.00

CREAM TEST BALANCE



No. 4042A

4062A **BALANCE, CREAM TESTING—Torsion.** An accurate twelve bottle scale equipped with sliding revolving tare. Sensibility 16 milligrams. Mechanism enclosed in metal case, finished in white enamel. Equipped with arrest. One 9-gram and one 18-gram weight included. Price with one 9-gram and one 18-gram weights.....$30.00

SUNDRIES

No. 4062B

No. 4062C

No. 4062D

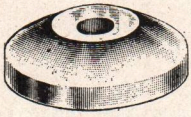
4062B **SCALE PANS.** With handles.
Glass, 2½, 2¾, 3 inches.....per pair $0.75
Nickel, 2½, 2¾, 3 inches.....per pair 1.50
Aluminum, 2½, 2¾, 3 inches.....per pair 1.95

4062C **SCALE PANS.** For counter scales, nickel-plated.

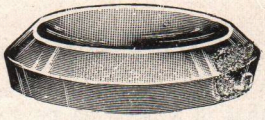
Size .....inches	6	7	8	9	10
Per pair	$1.65	1.95	2.60	3.25	4.55

4062D **SCALE PANS.** Of aluminum, for assay balances, ¾ inch diameter, accurately checked.....per pair $1.50

4062E **SCALE PANS.** Of glass, same size and style as aluminum ..... per pair 1.50



No. 4062F



No. 4062G

No. 4062H

4062F **SCALE GLASS FEET.** For holding leveling screws of balances, giving perfect insulation.....set of four $1.00

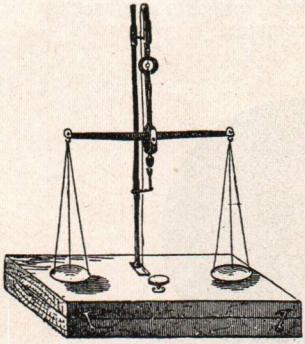
4062G **SCALE RUBBER PADS.** For same purpose.....each .20

4062H **SCALE WATCH GLASSES.** Glass, accurately counterpoised for analytical work. Sizes: 2½, 3 and 3½ inches in diameter .....per pair 1.50

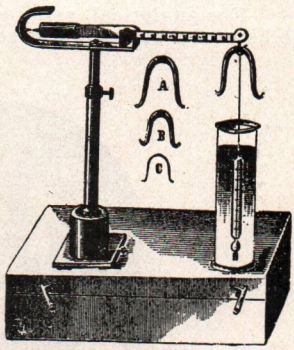
4062I **SCALE COVERS.** See index.

4062J **WEIGHING CAPSULES.** Of pure nickel, 4½ inches long....each .40

BALANCES



No. 4063A



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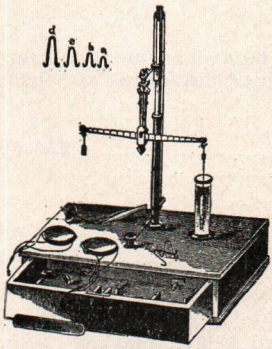

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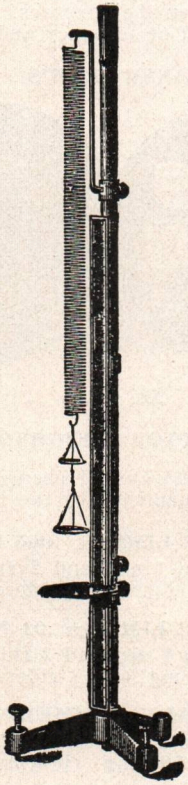

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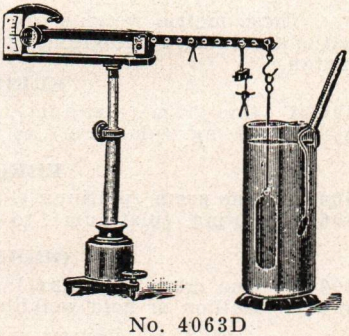


No. 4063D

4063A **PLATTNER'S BLOW PIPE BALANCE.** For blow pipe analysis, sensitive to 1 milligramme. Nickel-plated, with set of weights, from 1 gramme to 1 milligramme, in polished wooden case $25.00

4063B **MOHR'S SPECIFIC GRAVITY BALANCE, TYPE 198.** For both liquids and solids, with Reimann's Patent Thermometer, riders, glass cylinder, forceps, also extra pans for regular weighings 32.50

4063C **WESTPHAL'S SPECIFIC GRAVITY BALANCES, TYPE 9595.** For liquids only, in polished box, with movable support, and Reimann's Patent Thermometer 21.00
Plummet only 4.75
Set 8 riders only 2.00

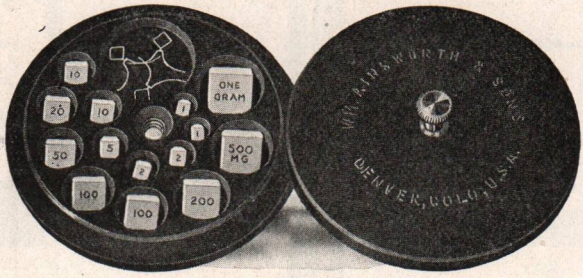
4063D **SARTORIUS HYDROSTATIC BALANCE.** For specific gravity, determination of liquids, complete in case 30.00

4063E **PROF. JOLLY'S SPIRAL BALANCE.** For rapid and exact determination of the specific gravity of minerals, with three assorted spirals, on wooden support and scale on mirror glass 20.00

WEIGHTS OF PRECISION

For analytical, assay and scientific purposes. These weights are warranted to be of the very highest standard of accuracy and precision.

AINSWORTH'S



No. 4064A

BUTTON WEIGHTS

These metric weights are guaranteed accurate subdivisions of the International Standard Kilogram, as furnished by the Bureau of Standards at Washington.

ERROR LIMIT ± .005 MG.

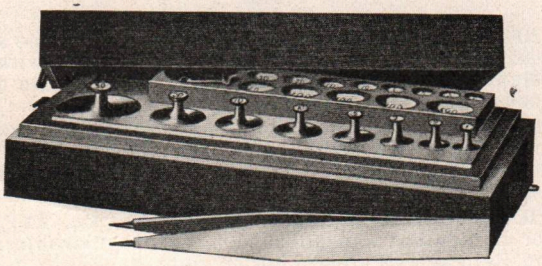
4064A	One gram (platinum), to 1 mg. and 2 riders	$25.00
4064B	50 mg. (platinum), to 1 mg. and 2 riders	12.00

ERROR LIMIT ± .01 MG.

4064C	One gram (platinum), to 1 mg. and 2 riders	15.00
4064D	50 mg. (platinum), to 1 mg. and 2 riders	8.00

ORDINARY COMMERCIAL

4064E	One gram (platinum), to 1 mg. and 2 riders	12.50
4064F	Bullion or gold weights 500 mg. (platinum), to 5 mg., marked 1000 to 1	12.50



No. 4064G

ANALYTICAL WEIGHTS

		Lacquared	Gold Plated
4064G	10 grammes down to 1 mg. and 2 riders	$13.50	$15.00
4064H	20 grammes down to 1 mg. and 2 riders	15.00	17.50
4064I	50 grammes down to 1 mg. and 2 riders	17.50	20.00
4064J	100 grammes down to 1 mg. and 2 riders	20.00	22.50

WEIGHTS OF PRECISION

AINSWORTH'S

No. 4065A SINGLE MILLIGRAM WEIGHTS

Put up in sealed boxes containing 1, 2, 6 and 12 each.

Grade	Code word	Milligrams	1000	500	200	100	50	20	10	5	2	1
A- Error limit + or —.005 Mg.	AMASS	Price each:	$5.00	4.00	3.00	2.00	1.50	1.00	1.00	1.00	1.00	1.00
B- Error limit + or —.01 Mg.	ANEW	Price each:	$3.00	2.00	1.50	1.25	1.00	.60	.60	.60	.60	.60
C- Ordinary Commercial	APACE	Price each:	$2.25	1.50	1.00	.75	.50	.30	.30	.30	.30	.30
Bullion wghts. 1000=500 Mg.	ARAB	Price each:	$2.25	1.50	1.00	.75	.50	.30	.30	.30	.30	.30

No. 4065B MILLIGRAMME RIDERS

In ordering, state whether eye is parallel or at right angles to legs and on what make of balance they are to be used. Put up in sealed boxes containing 1, 2, 6 and 12 each.

Grade	Code word	Milligrams	12	10	6	5	3	2	1.2	1	.6	.5
A- Error limit + or —.005 Mg.	ASSENT	Price each	$1.00									
B- Error limit + or —.01 Mg.	ATE	Price each	$ .50									
C- Ordinary Commercial	AUBURN	Price each	$ .25									

No. 4065C

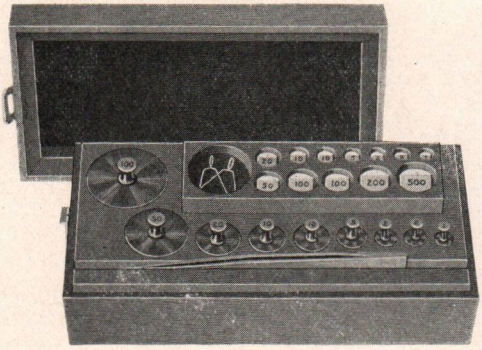
ASSAY TON WEIGHTS.

4065C One Assay Ton to 1—20 (.05), Brass.....$6.00
4065D Four Assay Tons to 1—20 (.05), Brass..... 8.00

The assay ton contains as many milligrammes (29.166) as there are Troy ounces in a ton (2,000 lbs.) avoirdupois; hence, if one assay of ore yields a button weighing one milligramme, the ore carries one ounce to the ton.

BALANCE WEIGHTS

ANALYTICAL



No. 4066A

4066A Analytical Troemner's weights. First quality. In French polished box, loose cover, velvet lined, with forceps. Adjusted to utmost accuracy. Brass weights are lacquered. Fractional weights below 20 mg., are aluminum. Sets abov 10 grams have 3 riders.

Sets, 1 mg. to	10	20	50	100	200	500	1000 grams
Price, set	$28.75	30.00	31.25	32.50	35.25	41.25	53.50

4066B **WEIGHTS,** Analytical Troemmer's, special double checked, gold plated, same type an No. 4066A.

Sets, 1 mg. to	10	20	50	100	200	500	1000 grams
Price, set	$41.50	47.00	49.50	53.50	60.00	74.25	89.75

4066C **ASSAY TON WEIGHTS,** of 1/20 A. T. to 4 A. T. in a box. Accurately adjusted to the standard of 29,166 grams to the ton. One ton (avoirdupois 2,000 pounds) of ore contains 29,166 Troy ounces, which is the number of milligrams in an assay ton, hence an assay ton of ore, producing a button of one milligram, is shown to carry one ounce Troy to the ton. With these weights the most accurate results can be obtained, great care being taken to preserve the proper ratio.

4066D 4 A. T. to 1/20 A. T. $10.50
4066E 1 A. T. to 1/20 A. T. 7.80

MILLIGRAM WEIGHTS, FRACTIONAL

4066F Set comprising one ½ milligr., two 1/5 milligr., one 1/10 milligr. ..$1.50

RIDERS, SINGLE

4066G	Milligrammes	12	10	6	5	2	1	½
	Each, single check	$0.35	.35	.35	.35	.55	.55	.65
	Each, double check	1.00	1.00	1.00	1.00	1.00	1.00	1.00

THOMPSON BALANCE WEIGHTS

"BLUE SEAL" FLAT WEIGHTS FOR GOLD ASSAYING

Error limit + or — .005 milligram.

4067A	1 gram (gold) down to 1 milligram and 2 riders	per set	$25.00
4067B	50 milligram (gold) down to 1 milligram and 2 riders	per set	12.00

"RED SEAL" FLAT WEIGHTS FOR SILVER ASSAYING

Error limit + or — .01 milligram.

4067C	1 gram (gold) down to 1 milligram	per set	$15.00
4067D	100 milligrams (gold) down to 1 milligram	per set	9.00

4067E **PRECISION WEIGHTS AND RIDERS—Separately.**

"Red Seal" Error Limit Error Limit + or — .005 mg.			"Red Seal" Error limit + or — .01 mg.		
1 mg.	each,	$1.00	1 mg.	each,	$0.75
2 mg.	each,	1.00	2 mg.	each,	.75
5 mg.	each,	1.00	5 mg.	each,	.75
10 mg.	each,	1.25	10 mg.	each,	.75
20 mg.	each,	1.50	20 mg.	each,	.75
50 mg.	each,	1.75	50 mg.	each,	.90
100 mg.	each,	2.50	100 mg.	each,	1.10
200 mg.	each,	3.00	200 mg.	each,	1.60
500 mg.	each,	4.00	500 mg.	each,	2.60
1000 mg.	each,	5.00	1000 mg.	each,	4.00

ASSAY TON WEIGHTS

4067F	One assay ton down to 1/20 A. T.	per set	$5.00
4067G	Four assay ton down to 1/20 A. T.	per set	8.00

EXTRA PANS FOR BALANCES

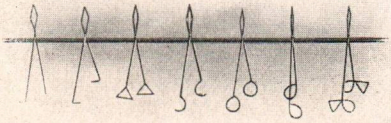
4067H	¾-inch Aluminum for Button Balances	per pair	$1.00
	¾-inch Smoked Glass for Button Balances	per pair	1.50
	¾-inch Clear Glass for Button Balances	per pair	1.00
	3-inch Aluminum for Analytical and Pulp Balances	per pair	1.00
	3-inch Brass for Analytical and Pulp Balances	per pair	1.00
	3-inch Glass without handles for Analytical and Pulp Balances, per pair		1.00

RIDERS FOR BEAMS

4067I Any weight from ½ milligram to 12 milligrams furnished at following prices:

1st Grade "BLUE SEAL" Error limit + or — .002 mg.		2nd Grade "RED SEAL" Error limit + or — .005 mg.		3rd Grade "WHITE SEAL" Error limit + or — .01 mg.	
Packed in sealed box containing	Price, per box	Packed in sealed box containing	Price, per box	Packed in sealed box containing	Price, per box
2 riders	$2.00	2 riders	$1.50	2 riders	$1.00
6 riders	4.50	6 riders	3.50	6 riders	2.25
12 riders	7.50	12 riders	6.00	12 riders	4.00

BUTTON BALANCES

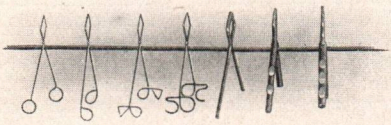


1 2 3 5 10 20 30 Milligrams.

4068A RIDER WEIGHTS FOR MULTIPLE RIDER ATTACHMENT ON BUTTON BALANCES

1st Grade "GREEN SEAL" Error limit + or — .005 mg.			2nd Grade "BLACK SEAL" Error limit + or — .01 mg.			3rd Grade "YELLOW SEAL" Error limit + or — .015 mg.		
1 mg.	Each,	$1.00	1 mg.	Each,	$0.50	1 mg.	Each,	$0.25
2 mg.	Each,	1.00	2 mg.	Each,	.50	2 mg.	Each,	.25
3 mg.	Each,	1.25	3 mg.	Each,	.75	3 mg.	Each,	.50
5 mg.	Each,	1.25	5 mg.	Each,	.75	5 mg.	Each,	.50
10 mg.	Each,	1.25	10 mg.	Each,	.75	10 mg.	Each,	.50
20 mg.	Each,	1.25	20 mg.	Each,	.75	20 mg.	Each,	.50
30 mg.	Each,	1.25	30 mg.	Each,	1.00	30 mg.	Each,	.75
Full Sets	Set,	8.00	Full Sets	Set,	4.50	Full Sets	Set,	3.00

4068B RIDER WEIGHTS FOR MULTIPLE RIDER ATTACHMENT ON ANALYTICAL BALANCES

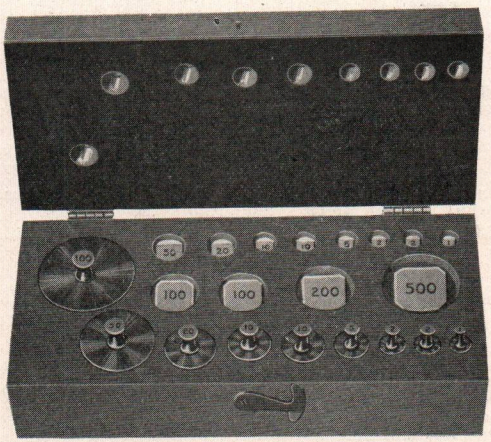


10 20 30 50 100 200 300 Milligrams.

FIRST GRADE "PINK SEAL"—Error Limit + or — .015 mg.

10 mg.	Each,	$0.50
20 mg.	Each,	.50
30 mg.	Each,	.75
50 mg.	Each,	1.00
100 mg.	Each,	1.50
200 mg.	Each,	2.50
300 mg.	Each,	3.00
Full Set	Set,	9.00

WEIGHTS OF PRECISION



No. 4069

4069A **GRAMME WEIGHTS.** In polished mahogany box.

20 grammes to 1 centigramme	$ 3.00
50 grammes to 1 centigramme	5.00
100 grammes to 1 centigramme	6.00
500 grammes to 1 centigramme	10.00
1 kilogramme to 1 centigramme	12.00

4069B **GRAMME WEIGHTS.** Brass; in block.

20 grammes down to 1 centigramme	2.25
50 grammes down to 1 centigramme	2.75
100 grammes down to 1 centigramme	3.60
500 grammes down to 1 gramme	4.90
1000 grammes down to 1 gramme	7.50

4069C **METRIC WEIGHTS.** Of japanned iron; loose. No. 33.

1 kilogramme down to 10 grammes; total weight 2 kilo.	3.15
2 kilogrammes down to 10 grammes; total weight 4 kilo.	4.20
5 kilogrammes down to 10 grammes; total weight 10 kilo.	8.10
10 kilogrammes down to 10 grammes; tital weight 20 kilo.	12.95

4069D **TROY WEIGHTS.** Brass; in mahogany box, lined with velvet.

All small weights are of aluminum, fitted separately.

One 1-oz. piece down to ¼ grain	3.50
Two 2-oz. piece down to ¼ grain	6.25
One 5-oz. piece down to ¼ grain	7.75
One 10-oz. piece down to ¼ grain	10.00
One 20-oz. piece down to ½ grain	15.00
One 50-oz. piece down to ½ grain	20.00
Two 100-oz. piece down to 1 grain	30.00
One 200-oz. piece down to 1 grain	40.00

WEIGHTS

No. 4070A

GRAIN WEIGHTS, GRADE "T"

TROEMNER'S SQUARE ALUMINUM GRAIN WEIGHTS

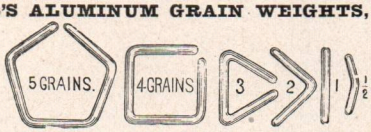
Made of pure sheet aluminum; concave, so they can be picked up readily.

			Price
4070A	Type 56	½ grain to 10, per set, in paper box	$0.65
		Per doz. set, net	

Price, single, separate from full set:

Grains	10	5	2	1	½	Grain	¼	⅛	1/16
Price	$0.20	.20	.20	.20	.20		.33	.33	.33

TROEMNER'S ALUMINUM GRAIN WEIGHTS, GRADE "T"



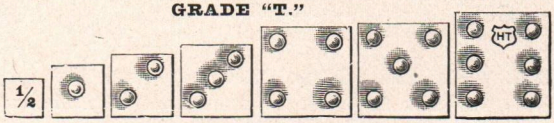
No. 4070B

			Price
4070B	Type 55	½ to 5 grains, per set, in paper box	$0.55
		Per doz. set, net	

Price, single, separate from full set:

Grains	5	4	3	2	1	½	.5	.2	.1
Price	$0.13	.13	.13	.13	.13	.13	.13	.13	.13

GRADE "T."



No. 4070C

			Price
4070C	Type 588	½ to 6 grains, per set, in paper box	$0.30

Price, single, separate from full set:

Grains	6	5	4	3	2	1	½
Price	$0.13	.13	.11	.11	.11	.11	.11

NORMAL SUGAR WEIGHTS, GRADE "C"

Made of round brass in two pieces (body and screw knob), fitted into hardwood block with hinged lid.

		Set		Price	No.	Code Word.	Price, Gold Plated
4070D	2 weights	13.024, 26.048	grams	$5.20	8515.	Zamzo	$5.85
4070E	3 weights	13.024, 26.048, 52.096	grams	6.50	8516.	Zampt	7.50
4070F	4 weights	13.024, 26.048, 52.096, 65.120	grams	7.80	8517.	Zamwo	9.75

SEPARATE WEIGHTS AS ABOVE.

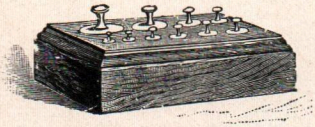
4070G	Weight Value.	½ Normal	Normal	Double Normal	2½ Normal
	Grams	13.024	26.048	52.096	65.120
	Price	$1.65	1.65	1.65	1.65
	Price Gold Plated	1.95	1.95	2.30	2.30

4070H **DECIMAL TROY GRAIN WEIGHTS, FIG. 61.** 50 grains down to 10 grains. Nickel-silver $1.30
Single weights, as above, each ..... .26

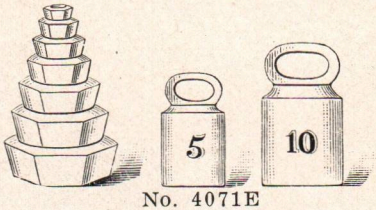
4070I **TROY BLOCK WEIGHTS OF SOLID BRASS, NO. 37.** In cherry block. Price
1 oz. down to ½ grain 1.65
2 oz. down to ½ grain (two) 2.60
5 oz. down to ½ grain 3.60
10 oz. down to ½ grain 5.85

4070J **TROY BLOCK WEIGHTS OF BRASS, NO. 38.** Highly finished; in ash block. Price
20 oz. down to ½ grain 10.00
30 oz. down to ½ grain 13.00
50 oz. down to ½ grain 18.00

WEIGHTS



No. 4071A



No. 4071E

4071A **AVOIRDUPOIS WEIGHTS, BRASS.** In cherry block.

1 lb. down to 1/8 oz. ..... per set $3.90
2 lbs. down to 1/8 oz. ..... per set 5.00
4 lbs. down to 1/8 oz. ..... per set 6.50

4071B **AVOIRDUPOIS WEIGHTS, BRASS.** Standard quality, in oiled walnut block, lined with poplar to prevent shrinkage; weights of the highest finish; burnished.

Set From	Total Weight	Price, Oak Block Brass
¼ oz.-1 lb.	2 lbs.	$ 7.80
¼ oz.-2 lbs.	4 lbs.	10.40
¼ oz.-4 lbs.	8 lbs.	13.00

4071C **IRON METRIC WEIGHTS, GRADE "T."** Made of cast iron, with sealing hole on top of the weight and filled with lead the adjusting medium. Furnished in one finish (Japan black) only. Type 33.

Sets, 10 grams to	1	2	5	10	20
Price, per set	$3.15	4.20	8.10	12.95	22.50

4071D Single iron metric weights as above:

Kilos	20	10	5	2	1
Price	$9.75	4.90	3.25	1.20	.65
Grams	500	200	100	50	20	10
Price	$0.52	.39	.33	.26	.20	.20

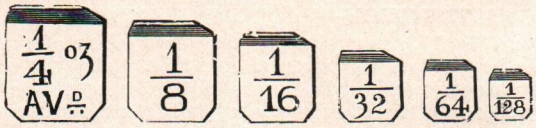
4071E **AVOIRDUPOIS IRON WEIGHTS.** Japanned, nested.

1 lb. down to ½ oz. Total weight, 2 lbs. ..... per set $2.00
2 lbs. down to ½ oz. Total weight, 4 lbs. ..... per set 2.50
4 lbs. down to ½ oz. Total weight, 8 lbs. ..... per set 3.50
8 lbs. down to ½ oz. Total weight, 15 lbs. ..... per set 6.00
10 lbs. down to ½ oz. Total weight, 25 lbs. ..... per set 9.00

4071F **PRESCRIPTION WEIGHTS.** Of nickel, silver and brass.

2 drachms, down to ½ grain ..... per set $1.15

AVOIRDUPOIS FRACTIONS OF OUNCES, GRADE "T"



No. 4071G

4071G These weights are the fractions of Avoirdupois ounce, ¼ oz. and down to 1/128 Avoirdupois ounce. Type 60.

	Price
Nickel-silver	$2.00
Single weights, as above, each	.39

4071H **BULLION WEIGHTS, TROY,** for bullion weighing. Weights are brass, coin shape, from ½ dwt. up. Below ½ dwt. (5 grains to ½ grain) wire aluminum, in cardboard boxes.

	Price
½ dwt. to ½ grain	$0.65
10 dwt. to ½ grain	1.30
1 oz. T. to ½ grain	1.65
2 oz. T. to ½ grain	2.30

ANEROID BAROMETERS

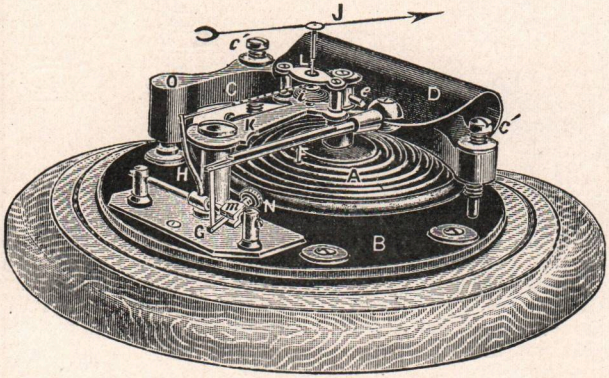


Fig. 1

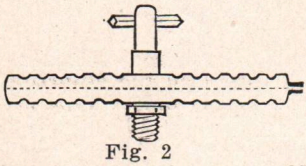


Fig. 2

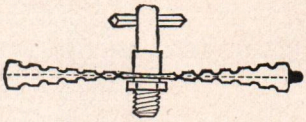


Fig. 3

ATMOSPHERIC PRESSURE

The atmosphere surrounding the earth may be regarded as an "Ocean" of air, extending upwards from the earth's surface about ten miles above sea level. Its greatest density is nearest to the earth's surface, by reason of having to support the weight of its whole depth; and it gradually becomes less dense as the distance from the earth increases. This law of decrease in pressure being known is used as a means of measuring the height of hills and mountains.

ANEROID

The world Aneroid is a Greek compound, expressing "without fluid." Aneroid Barometers are frequently termed "holosteric" barometers, but this is merely a fancy name to distinguish our present form of flat spring ("D") instrument from the older and less perfect spiral spring form.

CONSTRUCTION—VACUUM CHAMBER, "A"

The illustration (Fig. 1), shows the general construction of the movement with its elastic metallic box, called the vacuum chamber, "A."

This chamber is constructed with two circular discs of thin corrugated German silver, firmly soldered together at the edges, forming a close box, as shown in Fig. 2. The air is exhausted from this box, which causes the top and bottom discs to close together, as shown in Fif. 3. The pressure of air upon the outside surfaces of an ordinary size chamber is equal to a force of about 60 pounds.

The vacuum chamber, "A," is firmly fixed to the circular metal base, "B," by a post upon its center, projecting through the base plate.

BRIDGE, "C"

An iron bridge "C," spans the chamber, resting upon the base plate by means of the two pointed screws, c'c'. (These screws are used to finely regulate the tension upon the chamber "A".)

To the bridge "C," is fixed the mainspring, "D," which is forced down by mechanical means sufficient to insert the knife edge piece, "E."

ANEROID BAROMETERS

As the knife edge is fastened (by means of a central pillar) to the top disc of chamber "A," the mainspring, "D," when released, lifts the upper part of the chamber, drawing the two discs asunder so that the box again has the appearance as shown in Fig. 2.

As this forms a perfect balance (the power of the mainspring opposing the atmospheric pressure upon the vacuum chamber), any variation in air-pressure will now be shown by a movement up or down of the elastic chamber. A decrease in pressure will allow the mainspring to overcome the power of the vacuum, the action then being upwards, and an increase of air-pressure will produce the contrary result.

INDICATING HAND SHOWS RESULTS

This vertical action of the vacuum chamber is multiplied and converted to a horizontal movement of the indicating hand by a series of mechanical movements as follows:

Being attached to the mainspring, the lever, "F," is actuated by the movement of the chamber. It is attached to the short lever, "G," and again to the long lever, "H." From it, a fine chain extends to the center of the movement, passing around a central arbor or spindle, "I," upon which the indicating Hand, "J," of the Barometer is fixed, now having a horizontal motion, parallel to the Dial. The projecting arm, "K," carrying two small pillars, with a cross piece, "L," supports the central arbor or spindle.

The short lever, "G," projects from regulartor, "M," and is provided with an adjusting screw, "N." This, being capable of lengthening or shortening the lever, provides an adjustment by which the indicating Hand of the Barometer may be set to the correct position upon the Dial. This is done by turning the adjusting screw which passes through the base plate at the extremity of the bridge, ("O").

ADJUSTMENT

As there is sometimes a settlement of some of the metal parts and springs which alters the position of the indicating hand, it is advisable, whenever an opportunity offers, to compare the readings of an Aneroid with a standard Mercurial Barometer. If they do not agree, the Aneroid may be adjusted by turning the small adjusting screw until the indicating hand on the dial coincides with the height of the mercury column.

COMPENSATED

In the best made instruments the main lever, "G," is made of a composite bar of two metals, steel and brass, the quantity of each metal being altered until it is correctly compensated, for any change in temperature. This averts the necessity of making allowances for changes in temperature, as is necessary in reading a Mercurial Barometer.

IN GENERAL USE BY OBSERVERS

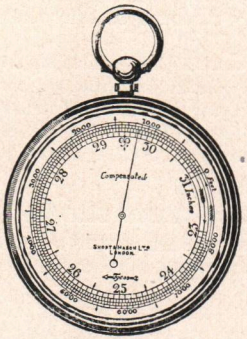
The Aneroid, owing to its portable form and great sensitiveness in responding to changes in pressure of the atmosphere (it will denote a change much quicker than the Mercurial Barometer), is to-day in more general use by observers of meteorological changes than any other form of Barometer.

ADVANTAGES

The Aneroid is indispensable to the navigator, as the motion of a ship renders a Mercurial Barometer so unsettled. In measuring altitudes, owing to its portability, sensitiveness and the ease with which approximate results may be obtained, it is highly valuable to the Engineer and Surveyor, while the Tourist, with the Aneroid, notes his gain in elevation foot by foot, as well as plans his excursions in accordance with prognostications from its readings.

Tycos 2¾″ POCKET ANEROID BAROMETERS

Made in England



No. 4074A

These instruments are fitted either with fixed or revolving altitude scales.

Fixed scales, however, are recommended, as no adjustment is necessary when taking an altitude reading, whereas with the revolving scale type it is necessary to turn the scale until zero line is in conjunction with 31″ of the Barometer dial.

This adpustment is occasioned by the unequal division of the altitude scale; the inch or barometer scale is equally divided, while the altitude scale gradually diminishes in value as it ascends. The higher the altitude the more thin or rare the air becomes. The true relation between the barometer and altitude scale exists only when the zero of the altitude scale and 31″ of the barometer scale coincide.

Tycos Barometers having fixed scales are set by means of a pointer which revolves inside the bezel. This pointer is set opposite the indicating hand when starting to make an ascent or descent. Any change in elevation during a journey or at its end will be the difference between altitudes, as shown by the index and the indicating hand.

(Best Quality)

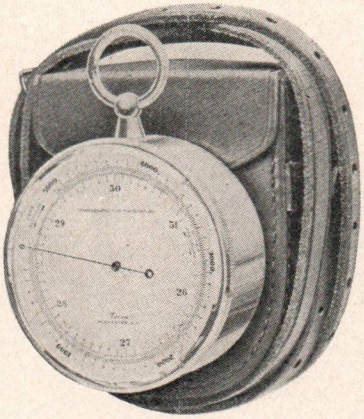
4074A **S. & M. *Tycos* ANEROID BAROMETER (Pocket Size), Type 2042** $20.50

Gold plated case. 2¾-inch diameter; silvered-metal dial, with altitude scale 8,000 feet in 50-feet divisions. Compensated for temperature. In best morocco case.

EXTRAS

4074B	3,000 feet altitude scale in 10-feet divisions	2.00
4074C	5,000 feet altitude scale in 20-feet divisions	.75
4074D	10,000 feet altitude scale in 50-feet divisions	.75
4074E	12,000 feet altitude scale in 50-feet divisions	1.75
4074F	16,000 feet altitude scale in 100-feet divisions	3.25

Tycos ALTITUDE BAROMETER



No. 4075A

The measurement of hills and mountains has always been of the greatest interest to the tourist, traveller and motorist. In surveying, this knowledge is essential.

The *Tycos* Altitude Barometer possesses a distinct, exclusive and valuable advantage over all other instruments of this character.

The graduations on the altitude scales of all barometers in the past have been in unequal divisions, which necessitates their being used in a certain way only. This means that a subtractive sum has to be worked out in order to get an accurate reading of elevation. Such altitude barometers are arranged either with their altitude scales engraved on the barometric pressure plate, or with the altitude scales made to revolve. Whichever way the instrument is made it is possible to use it correctly in only one way, and that is to keep the "0" on the altitde scale at the 31 point on the barometric pressre dial. This is because the altitude scale is unequally divided. Full information on the working of this pattern instrument is contained in the booklet "The Barometer as the Footrule of the Air."

With the new *Tycos* Altitude Barometer the scale is divided equally and revolves around the barometric pressure dial. This means that the zero on the altitude scale can always be set to the point of the hand, without error, so that in travelling the hand will always point to the true elevation of the instrument from its starting point, without any deduction or addition.

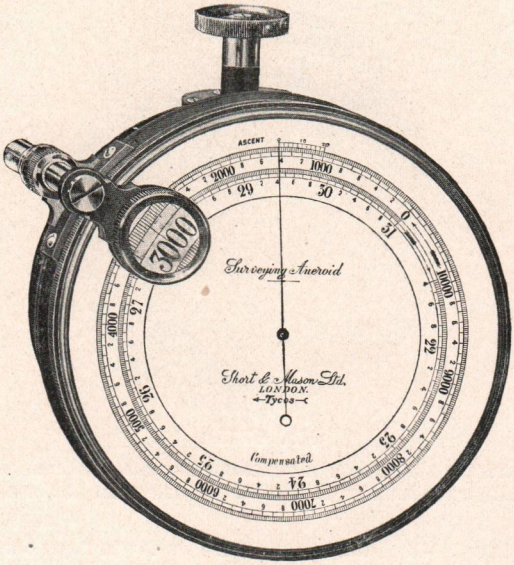
This feature is to be found only on the new aluminum-cased *Tycos* Altitude Barometer, and is considered to be the greatest advance in altitude barometer making in many years.

The *Tycos* Altitude Barometer is of American manufacture throughout. No pains has been spared to make it the most accurate, dependable serviceable and sensitive of instruments.

4075A	Reading to elevations of 5,000 feet in 20 feet divisions	$36.00
4075B	Reading to elevations of 10,000 feet in 50 feet divisions	37.00
4075C	Reading to elevations of 16,000 feet in 50 feet divisions	40.75

All of the above are in leather, stitched, sling carrying cases.

Tycos SPECIAL SURVEYING ANEROID BAROMETERS



No. 4076A

This instrument has been designed and constructed especially for the purpose of readily ascertaining slight variations in gradients, levels, etc. For approximate surveys and levelings, for roads, railways, canals, water courses and mines, it is invaluable, as its readings can be easily and rapidly taken.

Reading to single feet of altitude scale. Compensated for temperature.

Besides extreme sensitiveness the specialty claimed for the instrument is an arrangement of the scale of altitude which admits of subdivisions by a vernier, hitherto impracticable, owing to the altitude scale in ordinary use being a gradually diminishing one, to which a vernier could not be applied.

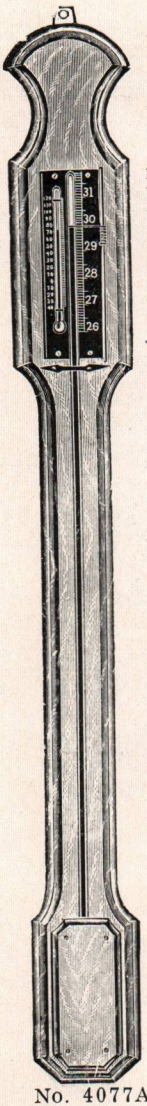
In the present instrument the action has been so arranged as to give accurate readings upon a regular scale of altitudes. The barometrical scale of inches having been made progressive to afford the correct relative readings with the scale of altitudes, this arrangement, therefore, in no way interferes with its use as an ordinary barometer.

4076A **S. & M. *Tycos* SURVEYING ANEROID BAROMETER, TYPE 2120.** Three-inch stout, bronzed-metal case; silvered-metal dial, with vernier scale moved by rackwork motion; reading lens arranged to traverse the entire circle; compensated for temperature; altitude scale 6,000 feet; in solid leather sling case. Weight 38 ounces $65.00

4076B **S. & M. *Tycos* SURVEYING ANEROID BAROMETER, TYPE 2121.** Same as Type 2120, except 5-inch case and weight 49½ ounces 70.00

4076C To 10,000 feet altitude, add to 2.75
4076D To 12,000 feet altitude, add to 4.50
4076E To 16,000 feet altitude, add to 6.50

MERCURIAL BAROMETERS



No. 4077A

IMPROVED MERCURIAL BAROMETER FOR SCHOOLS AND COLLEGES

Medium Grade

4077A Oak board, inch scale (26 to 31 inches) and metric scale (66cm to 78cm). Double Vernier, black oxidized finish, silver deposited figures ⅜-inch bore, sliding scale to allow for changing level of mercury in the cistern. Screw attachment for blocking the mercury. Total length 39 inches, F. and C. thermometer. For use in an altitude from sea level to 3,000 feet.

Type	Divisions	Double Vernier	Price
6190	1/10 inch	1/100 inch	$30.00
	1/10 cm	1/10 mm	

EXTRAS FOR ABOVE

Scale reading lower than 26 inches.

Symbol	Barometer, Inches	For use in altitude of	Add to list price
A	24 to 31	5,000 feet	$3.00
B	21 to 31	8,000 feet	4.00
D	18 to 31	12,000 feet	6.00
E	16 to 31	16,000 feet	7.00

Extra tube with screw stopper.....$12.00
Extra tube without screw stopper..... 10.50

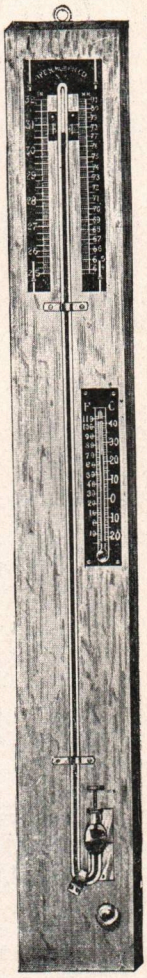
LIBRARY BAROMETER

Common Grade

4077B Type 6196. Oak frame, inch scale (26 to 31 inches) with thermometer. Black oxidized finish, silver deposited figures, ⅜-inch bore. Total length 42 inches sliding metal pointer.

Divisions 1/10 of an inch.....each $15.00

Extra tubes 10.50


No. 4077B

BASKETS, WIRE. See Wire.

Note—If goods are to be packed for mule back, kindly so specify in ordering.

OBSERVATORY BAROMETERS

Tycos-QUALITY (BEST GRADE)

Brass tube, inch scale (26″ to 31″) or metric scale (66 cm. to 78 cm.).

Black finish, silvered scale with black figures, ¼″ bore, engraved stem thermometer. Total length 39″. For use in altitudes from sea level to 3,000 feet above.

	Type	Divisions	Vernier	Price
4078A	6180	1/50″	1/1000″	$80.00
4078B	6182	1/10 cm	1/10 mm	75.00

For Barometer with scale reading lower than 26 inches, add the following to above list prices:

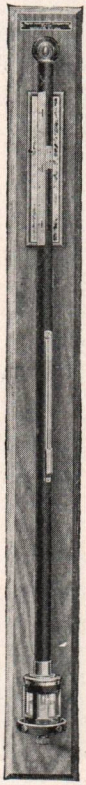
	Barometer inches	For use in altitude of	
4078C	24″ to 31″	5,000 feet	$5.00
4078D	21″ to 31″	8,000 feet	8.00
			Add to list price

4078D Oak board with opal-glass reflectors, suspension hook and steadying screws $10.00

4078E Glass cover for protecting the scale 3.50

4078F Inch and metric scale, double vernier, 1/1000″ 7.00

Special packing 2.50



No. 4078D

MARINE BAROMETERS

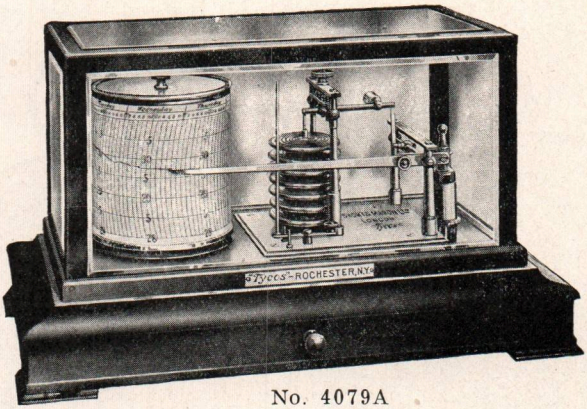
Tycos-QUALITY (BEST GRADE)

Fixed cistern without zero adjustment. The deviation caused by a rising or falling column is compensated for in the graduation of the scale. Each instrument is pointed in comparison with a Standard Barometer. To prevent oscillation of the mercury column from the motion of the boat, the lower end of the tube is contracted, and below this is a chamber to prevent small particles of air arising.

To insure safe delivery, these Barometers are shipped in a special box with inside fittings, for which a charge of $2.50 net is made, which is credited when the box has been returned to us, transportation charges prepaid.

4078G Type 6185. Brass tube, inch scale (26″ to 31″), black finish, German silver scale. Divisions 1/10″. Vernier reading to 1/100″, ¼″ bore. Engraved Stem Thermometer. Gimbal arm for attaching. Each in a carrying box $90.00

Tycos "STORMOGRAPHS," OR RECORDING BAROMETERS



No. 4079A

4079A **S. S M. *Tycos* "STORMOGRAPH,"** Type 2303 ..... $ 53.00
Mahogany frame, 14 inches long, 7 inches high, 8 inches deep, plain glass cover. Weight 7½ pounds.

4079B **S. & M. *Tycos* "STORMOGRAPH,** Type 2304 ..... $58.00
Same as Type 2303, except with beveled-plate glass. Weight 10¾ pounds.

4079C **S. & M. *Tycos* "STORMOGRAPH,"** Type 2305 ..... $63.00
Mahogany case, 14½ inches long, 8 inches high, 8¾ inches deep, beleved-plate glass, with front opening drawer, which has two divisions, for holding used and unused charts. Weight 11 pounds.

4079D **S. & M. *Tycos* THERMOGRAPH ATTACHMENT,** Type PP $25.00
Can be attached to any S. & M. *Tycos* Stormograph illustrated in this catalog.

4079E Extra charts for above (No. 20), one year's supply, per set 2.50
4079F Pens (V-shape) for above 1.00

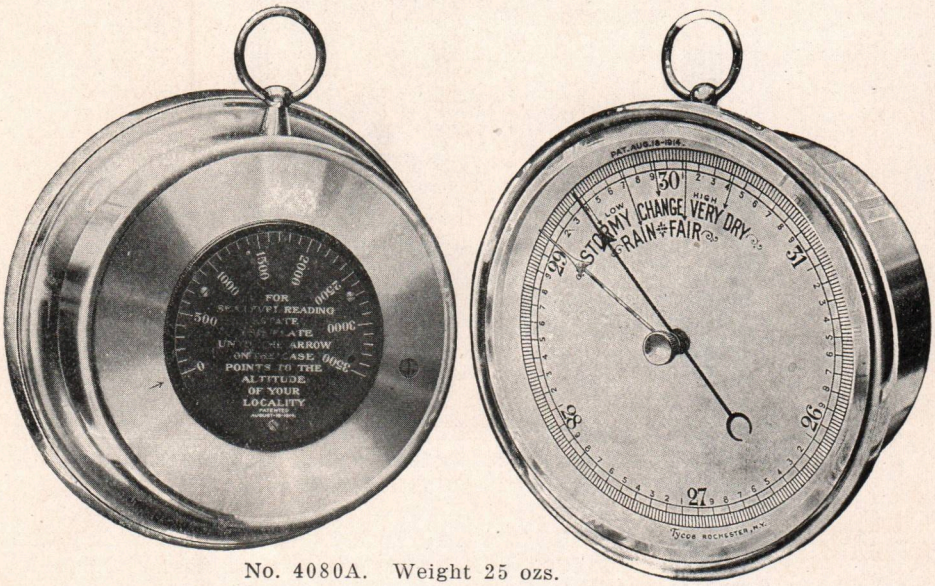
Extras for Stormographs

4079G Pens (ordinary) ..... .70
4079H Sets of Patent No. 2 perforated charts for regular instrument 2.00
4079I Sets of Patent No. 20 perforated charts for Stormo-Thermo Recorder 2.50
4079J Ink, plain bottle ..... .45
4079K Ink, stoppered bottle ..... .75

Tycos BRASS CASE BAROMETERS

With Revolving Back

Adjustable for Any Altitude up to and Including 7,000 Feet



No. 4080A. Weight 25 ozs.

An adjustment is made whereby the barometer hand points directly to the approximate weather mark and at a glance the weather is foretold."

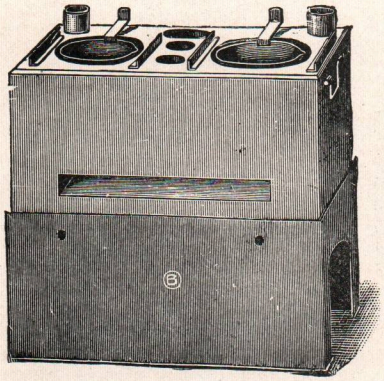
It is necessary to arrange all "weather words" on aneroid barometers in relation to the barometric pressure scale at sea level, in order to fix a standard level for observation.

Since barometric reading is affected by altitude, and it is obviously impossible, because of the enormous variety involved, to make special instruments for various altitudes from sea leel upwards, the desirable barometer is one provided with a means of adjustment whereby the observer may take observations, agreeing with sea level readings at any desired location.

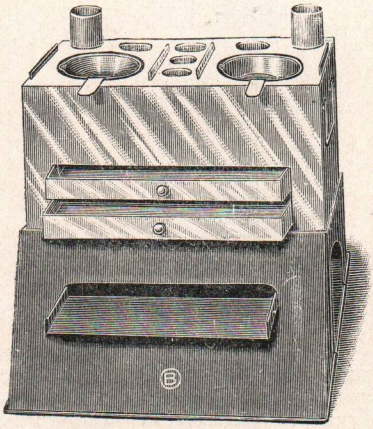
The instrument illustrated and described is arranged in such a manner that it is suitable for use in any location from sea level to 3,500 feet elevation. The adjustment is very simple and no derangement of the working parts is necessary. Once adjusted by the observer for a given location no further adjustment is required.

4080A	5" Lacquered brass case Aneroid Barometer, enamel dial, good grade movement, in cardboard box, Type 2252	$12.00
4080B	5" Lacquered brass case Aneroid Barometer, silvered metal dial, accurately divided and figured, best quality movement, compensated for temperature, in cardboard box, Type 2253	18.00
4080C	Same as Type 2252 except arranged for altitude from 3,500 to 7,000 feet, Type 2252½	13.50
4080D	Same as Type 2253 except arranged for altitude from 3,500 to 7,000 feet, Type 2253½	19.50

PARAFFINE BATHS



No. 4081A



No. 4081B

4081A Type 1340. **Paraffine Bath**—made of polished copper, 7 inches long, 3¾ inches wide and 3½ inches deep, with extra sheet iron bottom and iron base, which is 5 inches high. It is provided with a space for heating slides, and two nickel-plated cups. The shallow cup is 2⅛ inches diameter and ¾ inch deep, watch glass shape, and the deep one is 2⅛ inches diameter and 1½ inches deep. Also tubulations for thermometer; gas regulator and three test tubes.

Price .....each $13.00

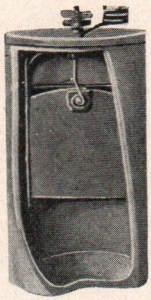
4081B Type 1345. **Parraffine Bath,** Miller's, made of polished copper 8 inches long, 4 inches wide and 4 inches deep, provided with an extra sheet iron bottom to prevent burning out, and iron base 5 inches high.

The bath has two nickel-plated cups, one shallow and one deep. The shallow cup is 2⅛ inches diameter and ¾ inch deep, watch glass shape, and the deep one is 2⅛ inches diameter and 1½ inches deep; also provided with two drawers to hold slides, and tabulations for thermometer, gas regulator and five test tubes.

Price .....each $16.00

EDISON-BSCO PRIMARY BATTERIES

Type 309

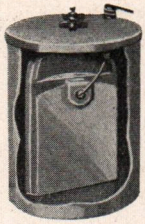


No. 4082A

Type 403

No. 4082B

Type 208



No. 4082C

4082A Type 309. Adapted for battery fan motors, small battery motors, programme and self-winding clocks, burglar alarms, fire alarms, electro-plating, chemical analysis and other school work, bell systems, etc. Also for various telephone purposes. Capacity, 300 ampere hours.
Size over all, 5¾x12¾ inches; complete, with porcelain jar.....each $5.00

Renewals

Complete renewal	each	5.00
Zinc-oxide assembled	each	4.50
One can caustic soda	each	.60
One bottle special battery oil	each	.20

Porcelain jars will be shipped unless otherwise specified.

Type 309 cells or renewals can be furnished with special low temperature electrolyte instead of the standard caustic soda, at an increase of 75 cents in the list price per cell or renewal.

4082B **BATTERY, EDISON BSCO,** Type 403. Adapted for mine signals, fire alarms, or gas engines. Size over all 7½x11; capacity 400 ampere hours. Complete with porcelain jar.

Price .....each $11.00

Renewals

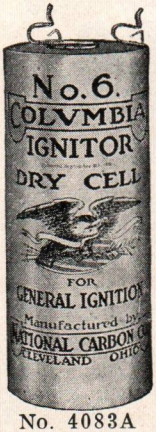
Complete renewal	each	6.50
Zinc-oxide assembled	each	6.00
One can caustic soda	each	.75
One bottle special battery oil	each	.20

4082C Type 208. Formerly known as Type 8. Adapted for stationery gas or gasoline engines, small motors, burglar alarms, bell systems, programme and self-winding clocks, annunciators, electric time stamps, mine signals, intercommunicating telephone systems, talking circuits for way-station telephones in railway, train dispatching systems, etc. Use five cells for stationary engines, having make-and-break ignition. Use eight cells for stationary engines having jump-spark ignition. Cell has flat cover, without gasket, and is recommended only for stationary work. Capacity, 200 ampere hours.

Size over all, 6x9 inches; complete, with porcelain jar.....each $7.00

For renewals, see Type 309.

BATTERIES



No. 4083A

COLUMBIA IGNITION is the original heavy duty cell. It was the first dry cell designed especially for ignition, and is particularly desirable for heavy duty such as gas engine ignition, telephone pole changers, telephone train dispatching, operation of miniature lamps, and street car signals.

			2½x6 Ignitor
4083A	Less than 12	each	$0.50
4083B	12 or less than 50	each	.45
4083C	50 or less than 125	each	.40
4083D	Bbl. lots of 125 or multiples	each	.38

4083E **COLUMBIA HOT SHOT BATTERY.** Columbia Hot Shot is a unit battery in an attractive red, moisture proof case. Soldered copper strips connect the individually tested cells, which are entirely surrounded by a water-proof insulating compound. It is only necessary to connect two wires to the binding posts. The battery is then ready to operate. Hot Shot is particularly useful for ignition where the variety of sizes makes it adaptable for motors of all sorts—stationary, vehicle or motor boat. It is very satisfactory for carriage lighting outfits.

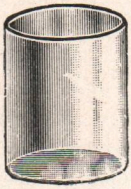
Prices on application.

No. 4083E

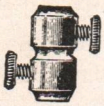
There are a great many places where a unit battery is desirable, and often conditions are found which preclude the use of a single series set of cells, or even a single series set of cells loosely connected. In this case a series multiple battery of dry cells, or a unit battery of even a single set of cells in series will successfully accomplish the work.

Such service is represented by boat lighting, blasting, electric vibrator massage machines, violet ray machines, refrigerator lights, auto horns, train dispatching, barn lighting, and especially by motor boat ignition and mine signals.

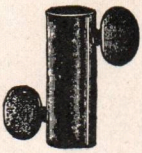
BATTERY SUNDRIES



No. 4084A



No. 4084C



No. 4048 D

4084A—**BATTERY JARS.** Round, of glass.

Width ....in.	4	5	5	6	9	9
Height ....in.	4	6	7	8	12	15
Each	$0.70	.90	1.15	1.40	3.50	4.25

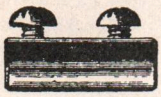
4084B **BATTERY CELLS.** Porous, round cups.

Width ....in.	2	2 ½	2 ⅝	3	3	3
Height ....in.	3	4 ½	5 ¼	5 ½	7	8
Each	$0.35	.45	.70	.90	1.30	3.50

4084C **BATTERY CONNECTIONS.** Building screws. Finished.

Single ....each $0.55
Double ....each .65

4084D **BATTERY CONNECTIONS.** Brass, double....each .75



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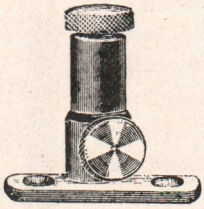
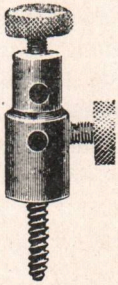


No. 4084F



No. 4084G

No. 4084H

4084E **BATTERY DOUBLE CONNECTIONS.** For two wires.

Small ....each $0.30
Large ....each .50

4084F **BATTERY BINDING POSTS.**

Double, with plate to screw to table....each .60

4084G **BATTERY BINDING POSTS.** With wood screw.

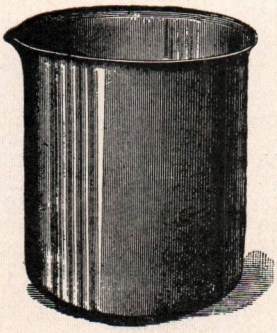
Single ....each .35
Double ....each .50

4084H **BATTERY BINDING POSTS.** American pattern.

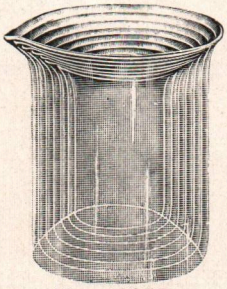
Small ....each .30
Medium ....each .40
Large ....each .50

BATTERY HYDROMETERS. See Hydrometers.

BEAKERS



No. 4085A



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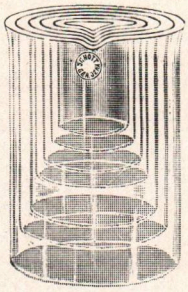


No. 4085C

4085A	**BEAKERS, ALUMINUM.** With lip.					
	Capacity	cc.	125	250	500	1000
	Price	each	$0.60	.80	1.20	1.60
4085B	**BEAKERS, COPPER.** Polished, heavy, with lip.					
	Capacity	cc.	125	250	500	1000
	Price	each	$0.55	.75	1.00	1.25
4085C	**BEAKERS, NICKEL-PLATED.**					
	Capacity	oz.	4	8	16	32
	Price	each	$0.70	.90	1.10	1.50

PAT. PYREX CORNING 5-27-19

PYREX BEAKERS

PAT. PYREX CORNING 5-27-19

Each article of Pyrex chemical ware is stamped with the trade-mark shown with its capacity marked within inner circle.

4085D Type 1

BRIFFIN BEAKERS
LOW FORM
With or without spout

Capacity C C	Number pieces in original package	List price, each, in broken package
30	312	$ .18
50	216	.18
100	156	.19
150	156	.21
250	168	.25
400	84	.30
600	72	.35
800	48	.40
1000	48	.54
1300	24	.65
1500	24	.73
2000	12	.98
2500	12	1.20

4085E Type 2

BERZELIUS BEAKERS
OR USUAL FORM
With or without spout

Capacity C C	Number pieces in original package	List price, each, in broken package
100	156	$ .19
150	120	.21
200	168	.23
300	144	.26
400	60	.30
500	60	.32
600	48	.35
800	48	.38
1000	36	.54

Unless otherwise stated, beakers with spout supplied.

Unless style of beaker is stated, the Griffin Low Form will be supplied.

BEAKERS

FRY—QUALITY

4086A Type 6010. **BEAKERS,** Griffin or low form, with lip.

Capacity, c.c	30	60	90	120	150	180	250	300
Price each	$0.12	.12	.13	.14	.15	.16	.17	.18
Number in case	216	216	156	156	156	168	168	168
Capacity, cc.	350	400	500	600	700	800	1000	1400	2000
Price each	$0.21	.22	.25	.26	.30	.34	.40	.55	.82
No. in case	84	84	84	72	72	48	48	24	12

4086B Type 6020. **BEAKERS,** Usual or Tall form, plain or lipped.

Capacity, cc.	30	60	90	120	180
Price each	$0.12	.12	.13	.14	.16
Number in case	216	216	156	120	168
Capacity, c.c.	250	300	350	500	700	1000	1200
Price each	$0.17	.18	.21	.25	.30	.40	.50
Number in case	144	144	60	60	48	36	36

Breakers and Flasks of Fry Resistance Glass are now in use in laboratories throughout the country. This guaranteed ware carries our well known trade mark, and has taken a permanent place as a standard American laboratory glass.

Fry Resistance Glass is sold at standard prices by all dealers in laboratory supplies. The prices in the following list, as far as they apply to trade-mrked articles finished in the factory, are subject to the following retail discounts only:

Less than full case lots.....Net
In full case lots.....10%

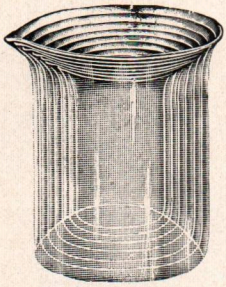
4086C **BEAKERS, GLASS.** Wide with pourout Griffin's form—Whitall Tatum Co.'s make.

No.				Each	Doz.
0000	1 oz.	30 cc.	1 7/8 x 1 3/8 ins.	$0.23	$ 2.30
000	2 oz.	60 cc.	2 1/8 x 1 5/8 ins.	.23	2.30
00	3 oz.	90 cc.	2 1/4 x 1 7/8 ins.	.26	2.60
0	4 oz.	120 cc.	2 3/4 x 2 ins.	.28	2.75
0A	5 oz.	150 cc.	2 3/4 x 2 1/4 ins.	.30	2.85
1	6 oz.	180 cc.	3 1/8 x 2 1/4 ins.	.30	2.90
2	8 oz.	250 cc.	3 3/8 x 2 1/2 ins.	.33	3.25
2A	10 oz.	300 cc.	3 5/8 x 2 3/4 ins.	.36	3.60
3	12 oz.	350 cc.	3 7/8 x 3 ins.	.40	4.10
3A	16 oz.	500 cc.	4 1/4 x 3 1/4 ins.	.50	4.90
4	20 oz.	600 cc.	4 5/8 x 3 3/8 ins.	.55	5.20
5	24 oz.	700 cc.	5 x 3 5/8 ins.	.60	6.00
6	32 oz.	1000 cc.	5 3/4 x 4 ins.	.90	9.10
7	48 oz.	1400 cc.	6 1/8 x 4 3/8 ins.	1.25	12.50
8	64 oz.	2000 cc.	7 5/8 x 4 3/4 ins.	1.60	16.50

BEAKERS

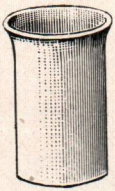
BEAKERS NONSOL

4087A Griffin Low Form with Lip.



No. 4087A

Type	Capacity	Per Doz.
2196	30 cc.	$ 2.20
1866	50 cc.	2.20
1886	100 cc.	2.30
1885	150 cc.	2.40
1891	160 cc.	2.60
2231	200 cc.	2.80
1892	250 cc.	2.90
2232	300 cc.	3.50
1887	400 cc.	4.00
2235	500 cc.	4.50
1894	600 cc.	5.00
1893	800 cc.	6.00
1880	1 L	8.00
2239	1.5 L	10.00
2240	2 L	14.00
2241	3 L	25.00
2313	5 L	40.00
2315	5 L	65.00



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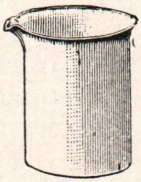


No. 4087C

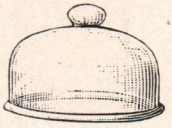
4078B Type 531 **PORCELAIN BEAKERS,** without lip, glazed inside and outside with exception of outside bottom surface.

Size number	1	1a	2	3	3a	4	5	6
Diameter rim, mm.	62	66	74	87	93	103	114	122
Diameter body, mm.	52	60	65	78	83	93	104	110
Height, mm.	93	108	118	143	154	167	198	209
Capacity, cc.	165	250	340	580	700	970	1,500	1.775
Each	$0.75	.90	1.00	1.20	1.50	1.80	2.50	4.00

4087C Type 532 **PORCELAIN BEAKERS,** with lip, glazed inside and outside with exception of outside bottom surface.

Size number	1	1a	2	3	3a	4	5	6
Diameter rim, mm.	62	66	74	87	93	103	114	122
Diameter body, mm.	52	60	65	78	83	93	104	110
Height, mm.	93	108	118	143	154	167	198	209
Capacity, cc.	165	250	340	580	700	970	1,500	1.775
Each	$0.85	1.00	1.10	1.35	1.65	2.00	2.75	4.25

BELL GLASSES AND BELLS



No. 4088A

No. 4088B

No. 4088C

4088A **BELL GLASSES.** Low form, with knob and ground bottom. Type 625.

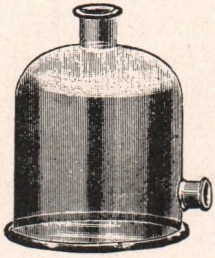
Inside height ....in.	2¾	4	5	7½	9
Inside diam. ....in.	4	6	8	10	12
Each	$1.00	1.50	2.00	3.25	5.00

4088B **BELL GLASSES.** Regular form, with knob and ground bottom. Type 636.

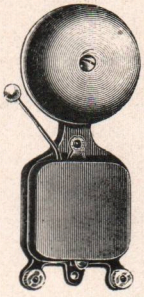
Inside diam. ....in.	2¾	4	5	6	7	10
Inside height ....in.	6	7½	9	11½	12	13½
Capacity ....gal.	⅛	¼	½	1	2	3
Each	$1.25	1.50	1.75	2.25	3.00	4.50

4088C **BELL GLASSES.** With tubulature at top. Type 634.

Inside diam. ....in.	5	7
Inside height ....in.	9	15
Each	$1.75	4.50



No. 4088D



No. 4088E

4088D **BELL GLASSES.** With tubulatures at top and near bottom.

Inside diam. ....in.	6	8
Inside height ....in.	8	12
Each	$3.00	5.00

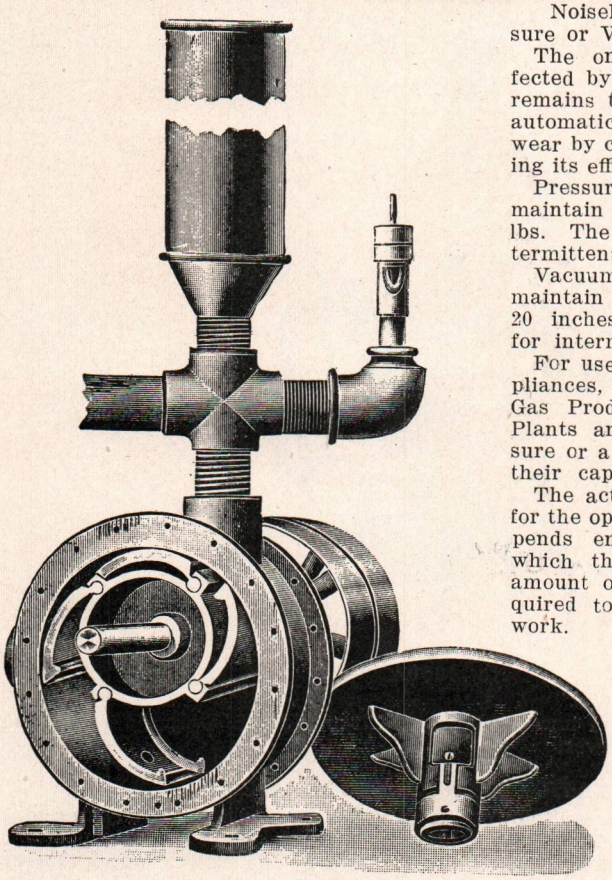
4088E **BELLS, ELECTRIC.** Iron box, nickel-plated.

Size ....in.	2½	3
Each	$0.75	1.25

BLAST LAMPS. See Burners.

BINDING POSTS. See Battery Connections.

LEIMAN PRESSURE BLOWERS AND VACUUM PUMPS



No. 4089A

Noiseless Air Pump for Pressure or Vacuum.

The only rotary pump not affected by wear; the winged piston remains tight under continual use, automatically taking up its own wear by centrifugal force, maintaining its efficiency.

Pressure—These blowers will maintain pressures from 1 oz. to 10 lbs. The highest pressures for intermittent services only.

Vacuum.—These pumps will maintain a vacuum of from 1 to 20 inches. The higher degrees for intermittent service only.

For use with all Gas and Oil Appliances, Agitators, Sand Blasts, Gas Producers, Vacuum Cleaning Plants and wherever air at pressure or a vacuum is required up to their capacities.

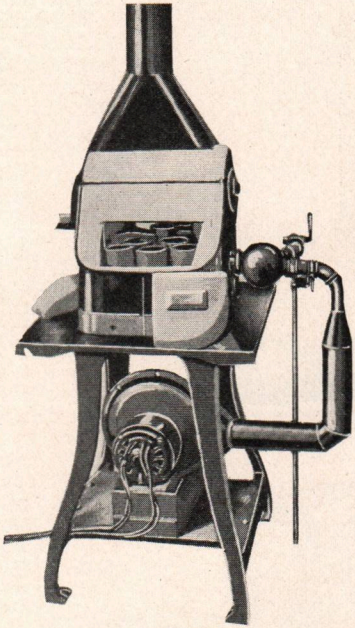
The actual horse power required for the operation of these pumps depends entirely on the speed at which they are run and on the amount of vacuum or pressure required to do any certain kind of work.

Size	Cubic Inches Delivered per Revolution	Max. Speed R. P. M.	Size Pulley, Inches	Horse Power for Approximate Minimum Pressure	Size of Inlet and Outlet, Inches	Weight, Pounds. Net	Weight, Pounds. Shipping (Crated)	Floor Space, Inches	Price, Each
A	17	600	3x1	1/10	½	20	23	10x 6	$ 27.60
B	30	600	4x1 ¼	⅛	¾	26	40	12x 8	39.25
C	80	400	5x1 ½	¼	1	43	61	15x10	51.75
D	200	300	7x2	½	1 ¼	76	112	19x15	57.50
E	400	250	12x2 ¼	1	1 ½	153	173	24x18	70.25
F	675	200	12x3	1 ½	2	250	287	28x22	103.50
G	1400	200	14x3	2 ½	2 ½	400	436	31x24	166.75
H	2592	200	20x3	------	4	------	578	----------	431.25

EQUIPMENT FURNISHED

A—Tight and Loose Pulleys only.
B—Tight and Loose Pulleys and relief valve.
C—Tight and Loose Pulleys and relief valve and tank.
D. E. F. G. and H—Tight and Loose Pulleys, Relief Valve, Tank and Inlet Pipe.

BLOWERS



No. 4090A

Illustration shows rotary flame combination furnace No. 40 with gas burner and combination motor and blower.

COMBINATION MOTORS AND BLOWERS

The combination motor and blower shown in illustration is especially designed for use with the Braun Gas Burner. It is made in the most substantial way possible. The motor will develop more power than is required by the blower, which insures it a long life and freedom from overheating.

This combination motor and blower will easily operate three gas burners. The cost of operating is very low, being practically the same as that of a sixteen candle power electric light.

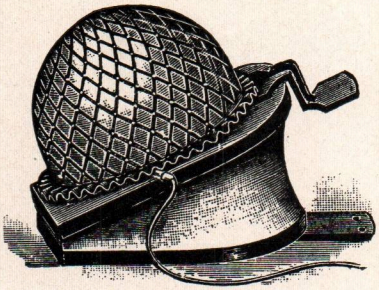
These blowers are made to operate on either 110 or 220 voltage for both alternating and direct currents.

In ordering pdease state voltage if direct current is to be used, and the voltage and cycles if the alternating current is to be used.

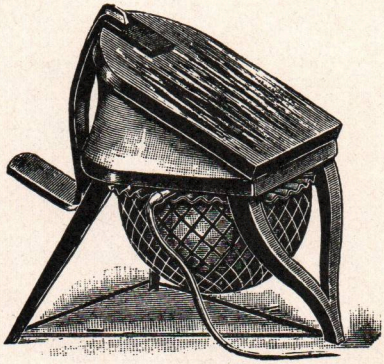
Net weight, 80 lbs. Shipping weight, 110 lbs.

	Type		
4090A	2076	**DIRECT CURRENT** (not including connections)	$70.00
4090B	2078	**ALTERNATING CURRENT** (not including connections)	80.00
4090C	2080	**BLOWER,** arranged for belt power	18.00
4090D	2082	**AIR PIPE,** galvanized sheet iron, 4 inches diameter, per foot	.20
4090E	2084	**AIR PIPE ELBOWS,** galvanized sheet iron, 4 inches diameter, each	.60
4090F	2086	**REDUCING CONNECTION,** for connecting air pipe to burner valve, each	.40

BLOWERS



No. 4091A



No. 4091B

4091A **BLOWERS, FLETCHER'S FOOT BELLOWS.** Gives a continuous blast of air.

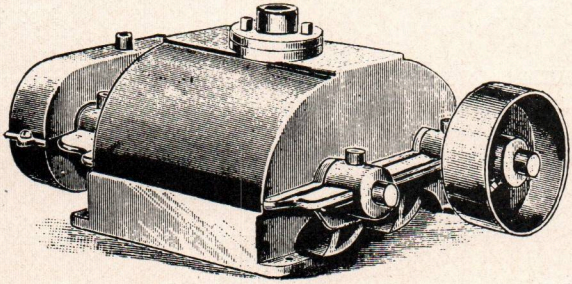
No.	9	9A	9B
Diameter ....inches	7¾	10	11
No. of discs	1	2	3
Each	$7.75	9.25	16.00

4091B **BLOWERS, FLETCHER'S FOOT BELLOWS.** Mounted on legs.

No.	10	10A	10B
Diameter ....inches	7¾	10	11
No. of discs	1	2	3
Each	$9.00	12.50	18.50

4091C **BLOWERS.** Extra rubber disk for Nos. 9 or 10, 9 inches....each $0.75
For No. 9A or 10A, 12 inches....each, 1.15
For No. 9B or 10B, 15 inches....each 1.65

4091D **BLOWERS.** Extra nets for above.... .50

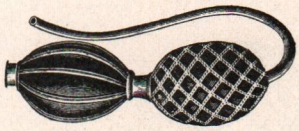


No. 4091E

4091E **BLOWERS, ROOT'S POSITIVE.**
3 size, 7x1½ pulley, 1½-inch outlet....$22.00
3½ size, 8x2 pulley, 2½-inch outlet.... 47.50
4 size, 10x3 pulley, 3-inch outlet.... 75.00

BLOWERS

No. 4092A

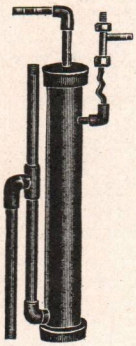


No. 4092B

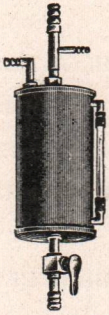
4092A **BLOWERS, HAND BELLOWS.**

Diam.	inches 10½	12
Each	$1.50	1.75

4092B **BLOWERS, HAND.**
Composed of two pure gum rubber bulbs, one covered with net, for continuous blast, each $2.00



No. 4092C



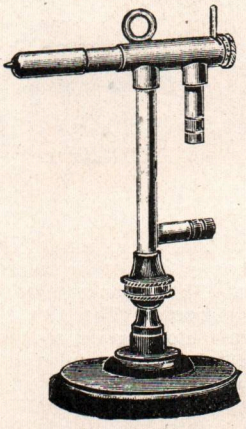
No. 4092D

4092C **BLOWERS, RICHARD'S WATER BLAST.** Where hydrant pressure is available this apparatus is desirable for quick filtering or as a blower for blast lamps. Both operations can be carried on simultaneously with the large sizes.

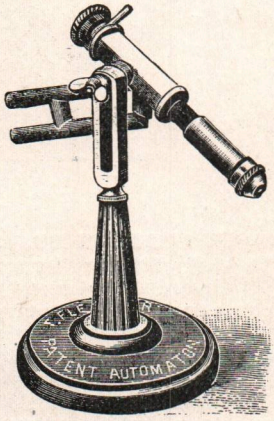
Size ..... Pumps	1	2	3
Price	$11.25	16.00	18.75

4092D **BLOWERS, MUENCKE'S WATER BLAST AND EXHAUSTER.**
Nickeled brass, with air outlet and water regulating stopcock, each $16.00
With vacuum gauge 25.00

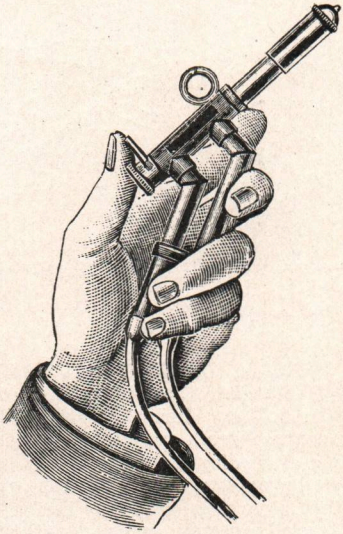
BLOW PIPES



No. 4093A



No. 4093B



No. 4093E

FLETCHER'S BLOW PIPES

4093A This blow pipe is mounted on a stand, with a universal ball joint, so as to enable it to be used at any angle or in any position. It is simple, self- adjusting, for both gas and air, requiring only a slight motion of a small lever to obtain instantly any flame from the smallest to the largest. It is made for coal gas only.

All automatons have the delicacy of the best mouth blow pipe used with the utmost skill, with the power and advantages obtained with a mechanical blower.

Price, Type 6A.....each $6.25

4093B The following are for illuminating gas only. The swivel gives even greater latitude of adjustment than the No. 4093A is capable of, while the blow pipe is easily detached and capable of use in the hand.

4093C Automaton 6D on Standard.....$6.75

4093D Automaton 6E on Standard..... 9.00

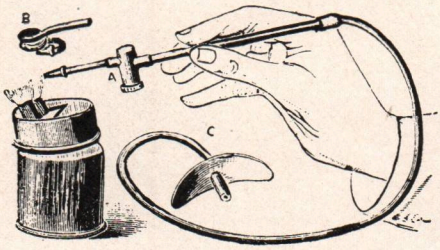
No. 4093E For illuminating gas only. The engraving shows the hand blow pipe with both air and gas tubes underneath, forming a most convenient pattern for small work, brazing, annealing, etc. The No. 6B is of the sam esize and No. 6A, and requires a ⅜-inch bore gas pipe and tap. No. 6C is similar in construction to the No. 6B, but larger, and requires for its fullest power a ½-inch clear-bore gas pipe and tap, and is adapted for the heaviest brass finishers' and bicycle makers' work.

4093E Automaton No. 6B, for ⅜-inch Gas Pipe.....$5.50

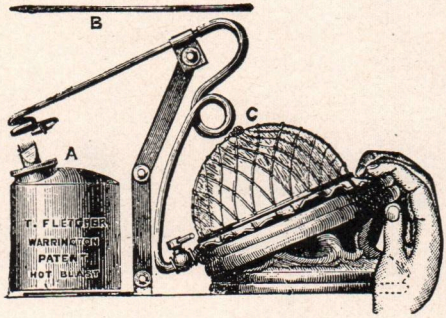
4093F Automaton No. 6C, for ½-inch Gas Pipe..... 7.65

Note—Nos. 6B and 6C Automaton Hand Blow Pipe will be found a most convenient pattern for small work, braing, annealing, etc. The No. 6B requires a ⅜-inch bore gas pipe and tap. The No. 6C requires for its fullest power a ½-inch clear-bore gas pipe and tap. The No. 6B requires blower No. 9A; No. 6C requires blower No. 9B.

BLOW PIPES



No. 4094A

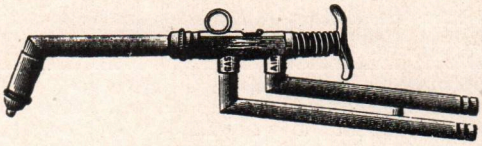


No. 4094B

4094A **BLOW PIPE, FLETCHER'S PATENT NO. 42.** The arrangement of the Fletcher Blow Pipe (No. 42) is totally different from that of any other made. The ordinary form has been entirely discarded, and every detail has been specially designed from practical experience as to the rquirements of users. The Mouthpiece is, of all, the easiest to use, and the heaviest continued blowing causes no strain on the lips, whilst the tongue has the necessary control over the opening. The blow pipe proper is held as a pencil. The chamber on the stem stops all condensed moisture and prevents the heat traveling up the shaft.
With cold blast and hot blast, two jets, nickel-plated mouthpiece.....$2.00

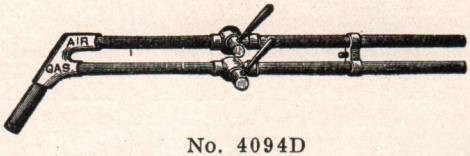
4094B With folding stand adjustable at any height or angle. It can be used either with the mouth, or the small hand-blower can be attached and the blowing done by pressure of the fingers. With this blow pipe is supplied one jet with and one jet without the hot blast coil, to enable a large variety of flame to be obtained. The lamp or a weight shou'd be placed on the stand when in use.

Blow Pipe, alone	$1.25
Blower alone	4.25
Complete as illustrated	5.50
Extra Rubber Discs ..... each	.25



No. 4094C

4094C **AUTOMATIC BLOW PIPE.** For light soldering, small size.....$5.50
Large size 7.75



No. 4094D

4094D **BLOW PIPE.** Small size, in brass, with two stop cocks, $\frac{3}{16}$-inch air tube and $\frac{7}{16}$-inch gas tube; length, 14 inches.....$2.50

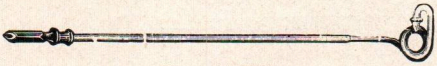
BLOW PIPES

No. 4095A

4095A **BLOW PIPE, FLETCHER'S TYPE 30.** Taper Shaft, Brass.....$0.80

No. 4095B

4095B **BLOW PIPE, FLETCHER'S TYPE 30A.** Straight Shaft, Brass.... .75

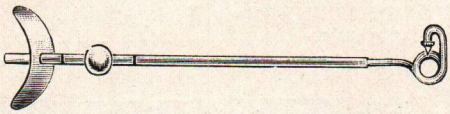


No. 4095C

4095C **BLOW PIPE, FLETCHER'S TYPE 30B.** Straight Shaft with Mouthpiece ..... .95

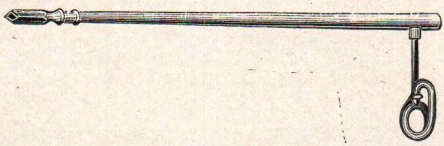
No. 4095D

4095D **BLOW PIPE, FLETCHER'S TYPE 30C.** Jointed with Hot and Cold Blast Jets..... 1.25



No. 4095E

4095E **BLOW PIPE, FLETCHER'S TYPE 30F.** With Moisture Bulb and Mouthpiece 2.00



No. 4095F

4095F **BLOW PIPE, FLETCHER'S TYPE 31.** Chemical Blow Pipe with Mouthpiece 1.60

No. 4095G

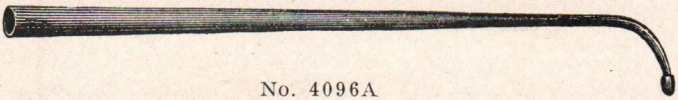
4095G **BLOW PIPE, JEWELERS' FORM.** Brass with Air Chamber.

Size, length, inches	8	10	12
Price, each	$0.55	.60	.75
Price, per dozen	5.40	6.00	7.80

4095H **BLOW PIPE, JEWELERS' FORM.** Brass without Air Chamber.

Size, length, inches	8	10	12
Price, each	$0.25	.30	.35
Price, per dozen	2.40	3.00	3.60

BLOW PIPES



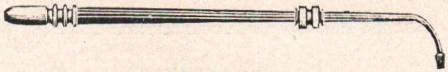
No. 4096A

4096A **BLOW PIPES, JEWELERS'.** Nickel-plated, with Air Chamber.

Size, inches	8	10	12
Price, each	$0.30	.35	.40

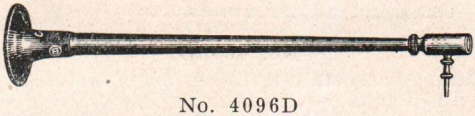
4096B **BLOW PIPE, JEWELERS'.** Nickel-plated, without Air Chamber.

Size, inches	8	10	12
Price, each	$0.25	.30	.35



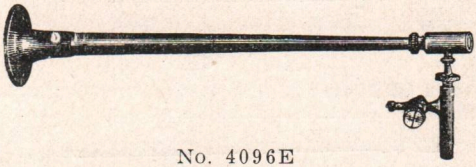
No. 4096C

4096C **BLOW PIPE, SCHOOL OF MINES PATTERN.** With moisture trap, made of brass with bone mouthpiece $0.75



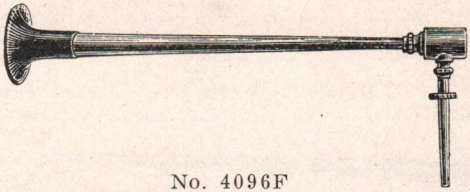
No. 4096D

4096D **BLOW PIPE, PLATTNERS'.** Nickel-plated, with mouthpiece without platinum tip 2.00



No. 4096E

4096E **BLOW PIPE, PLATTNERS'.** Nickel-plated, with hard rubber mouthpiece and blast attachment for gas 3.00



No. 4096F

4096F **BLOW PIPE, BERZELIUS'.** Brass, with mouthpiece and platinum plate 2.00

4096G **BLOW PIPE JET TIPS.** Brass, for all Fletcher's Mouth Blow Pipes ..... .15

4096H **BLOW PIPE TIPS.** Pure platinum, for Plattners' Blow Pipes. Price on application.

4096I **BLOW PIPE TIPS.** Brass, for Black's Blow Pipes, approximately .10

4096J **BLOW PIPE MOUTHPIECES.** Hard rubber, trumpet shaped, large, approximately ..... .40

4096K **BLOW PIPE MOUTHPIECES.** Horn, small, approximately ..... .30

PRESSURE OR BLOW PIPE TANKS FOR HYDROCARBON BURNERS

No. 4097A

4097A **FURNACE BLOW PIPE, CAPACITY, 8 GALLONS.** This size is the most popular and is the one recommended except for use with the smallest furnaces. It will contain enough gasoline for an entire day's run, leaving sufficient air space to avoid too frequent pumpings. The outfit consists of a pressed steel seamless tank, tested to 200 pounds pressure, tinned inside and out to prevent rusting; the tank is mounted on a removable cast iron base with a brass pump of large capacity, equipped with intake and outlet check valves and cock. The price includes a pressure gauge, 12 feet of ¼-inch black pipe in 3-foot lengths, nipples, elbows, tees, couplings, swivel joint, air cock, globe valve and fittings sufficient to operate one or more burners at once. Shipping weight, 75 pounds; price without burner $35.00

4097B **FURNACE BLOW PIPE, CAPACITY, 2 GALLONS.** Similar to No. 4097A. Price includes 9 feet of ¼-inch black pipe, nipples, elbows, tees, couplings, air cock and globe valve. Shipping weight, 50 pounds; price without gauge and burner 27.00

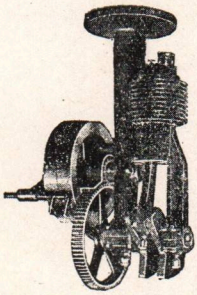
4097C **FURNACE BLOW PIPE, CAPACITY, 4 GALLONS.** Similar to No. 4097A. Equipment same as for 8-gallon outfit. Shipping weight, 60 pounds; price without burner or pressure gauge 30.00

4097D **FURNACE BLOW PIPE, CAPACITY, 15 GALLONS.** Similar to No. 4097A, but especially recommended for places with a large volume of work where several burners are operated at once. Equipment same as 8-gallon outfit. Shipping weight, 90 pounds; price without burner 40.00

4097E **PUMP, HAND FOR AIR.** Brass of large capacity, same as on blow pipe outfit illustrated No. 4097A; complete with inlet and outlet check valves and cock 6.00

4097F **INLET AND OUTLET CHECK VALVES, AND COCK** for above, extra. If a duplicate of an old set is wanted, send the old one with order if possible. Price 1.50

PUMPS AND FITTINGS FOR BLOW PIPE TANKS



No. 4098A

No. 4098A

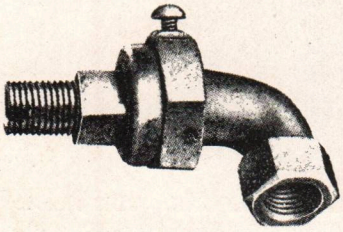
CLASS N AIR COMPRESSORS

Plain—Water Cooled

Diameter of Cylinder	2 inches
Length of Stroke	3 inches
Cubic feet per minute at max. speed	1.09
Crank Speed	200 R. P. M.
Working pressure	75 pounds
Outlet	¼ inch pipe
Size pulleys	8x1¼ inch belt

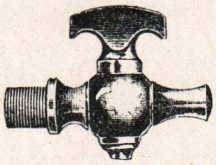
Horse power required at 75 pounds pressure 3/10
Price on application.

SWIVEL JOINT



No. 4098B

AIR COCK



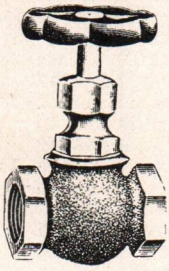
No. 4098D

4098B **SWIVEL JOINT WITH ELBOW.** With one male and one female thread, Size ¼ inch $0.75

4098C Same as above, but straight, with two male threads ..... .75

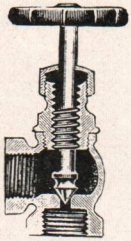
4098D **AIR COCKS.** Size ..... inches ⅛ ¼ ⅜ ½
Price ..... each $0.40 .45 .50 .60

BRASS VALVES



No. 4098E

No. 4098F



No. 4098G

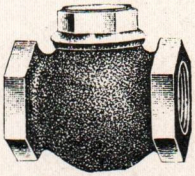
4098E **GLOBE VALVE.** With metal seat for use with gasoline, ¼ inch .. $0.72

4098F **ANGLE VALVE.** For same usage, ¼ inch ..... .72

4098G **NEEDLE GLOBE VALVE.** ¼ inch 1.25

BLOW PIPE TANK APPARATUS

CHECK VALVES

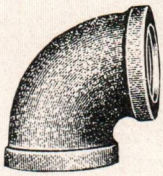


No. 4099A

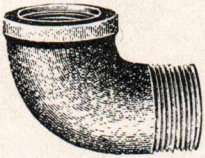
No. 4099B

4099A	Horizontal check valves, metal seat, ⅛-inch	$0.65
	¼-inch	.65
4099B	Vertical check valves, metal seat, ⅛-inch	.72
	¼-inch	.72

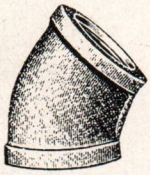
FITTINGS



No. 4099C



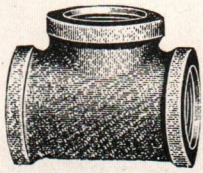
No. 4099D



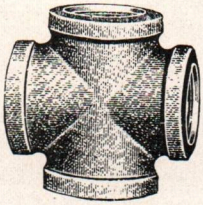
No. 4099E

FITTINGS, BLACK

		⅛-inch	¼-inch
4099C	Elbows, 90°	$0.06	$0.07
4099D	Elbows, street	.08	.10
4099E	Elbows, 45°	.....	.08



No. 4099F



No. 4099G

No. 4099H

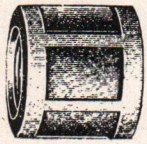
FITTINGS, BLACK

		⅛-inch	¼-inch
4099F	Tees	$0.07	$0.08
4099G	Crosses	.....	.09
4099H	Bushings, ⅛ to ¼-inch	.....	.04

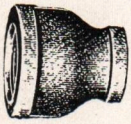
BLOW PIPE TANK APPARATUS

FITTINGS, BLACK

No. 4100A

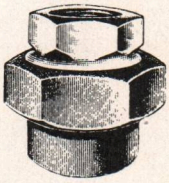


No. 4100B



No. 4100C

			⅛-inch	¼-inch
4100A	**COUPLINGS.**	Straight	$0.05	$0.05
4100B	**COUPLINGS.**	Right and left	.....	.07
4100C	**COUPLINGS.**	Reducing ¼ to ⅛-inch	.....	.05



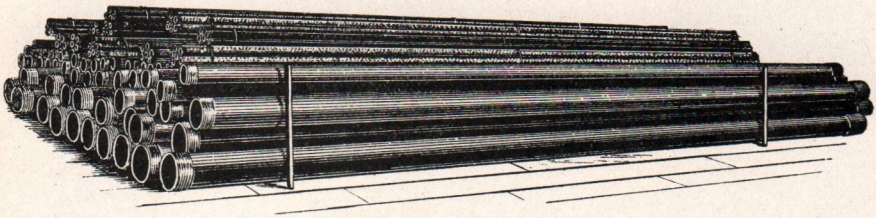
No. 4100D

No. 4100E

No. 4100F

			⅛-inch	¼-inch
4100D	**UNIONS.**	Kewanee, with brass seat	$0.30	$0.30
4100E	**NIPPLES, CLOSE**		.04	.04
4100F	**NIPPLES, LONG.**			
		Length, 1½ inches	.04	.04
		Length, 2 inches	.06	.06
		Length, 2½ inches	.06	.06
		Length, 3 inches	.06	.06
		Length, 4 inches	.07	.07
		Length, 6 inches	.10	.10
		Length, 12 inches	.19	.19
		Length, 24 inches	.25	.25
		Length, 36 inches	.30	.30

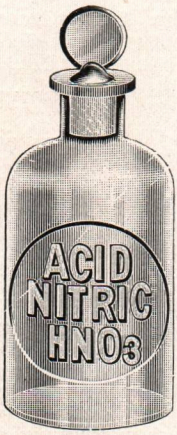
PIPE



No. 4100G

Pipe, black and other sizes of fittings quoted on application. We also carry galvanized fittings and pipe.

REAGENT BOTTLES WITH GROUND GLASS LABELS



No. 4101A

No. 4101B

These bottles have the chemical names and equivalents distinctly blown in the glass, thus avoiding the danger of confusion and the unsightly appearance of paper-labelled bottles, also the heavy expense of bottles with engraved letters.

All letters ground to make them perfectly visible. Any names not found in the list can be engraved on the bottles at small extra charge.

Please order by number.

4101A **REAGENT BOTTLES.** Capacity ¼ pint = 4 oz. = 125 cc. Height 5¼ inches. Per dozen, net $2.50

No.		
1.	Hydrogen Sulphide (Amb.)	H_2S
2.	Hydrochloric Acid	HCL
3.	Acetic Acid	$HC_2H_3O_2$
4.	Sulphuric Acid	H_2SO_4
5.	Nitric Acid	HNO_3
6.	Potassium Ferrocyanide	$K_4Fe(CN)_6$
7.	Potassium Sulphucocyanide	KCNS
8.	Potassium Carbonate	K_2CO_3
9.	Potassium Sulphate	K_2SO_4
10.	Potassium Iodine	KI
11.	Potassium Ferricyanide	$K_2Fe(CN)_6$
12.	Potassium Hydroxide	KOH
13.	Potassium Dichromate	$K_2Cr_2O_7$
14.	Sodium Phosphate	Na_2HOP_4
15.	Ammonium Hydroxide	NH_4OH
16.	Ammonia Sulphide (Amb.)	$(NH_4)_2S$
17.	Ammonium Chloride	NH_4CL
18.	Ammonium Carbonate	$(NH_4)_2CO_3$
19.	Ammonium Oxalate	$(NH_4)_2C_2O_4$
20.	Barium Chloride	$BaCl_2$
21.	Calcium Chloride	$CaCL_2$
22.	Calcium Sulphate	$CaSO_4$
23.	Calcium Hydroxide	$Ca(OH)_2$
24.	Magnesium Sulphate	$MgSO_4$
25.	Mercuric Chloride	$HgCL_2$
26.	Silver Nitrate (Amber)	$AgNO_3$
27.	Lead Acetate	$Pb(C_2H_3O_2)_2$
28.	Ferrous Sulphate	$FeSO_4$
29.	Ferric Chloride	Fe_2CL_6
30.	Alcohol	C_2H_5OH
31.	Ammonium Sulphocyanide	NH_4CNS
32.	Barium Hydroxide	$Ba(OH)_2$
33.	Barium Carbonate	$BaCO_3$
35.	Ether	$(C_2Hs)_2O$
36.	Cupric Sulphate	$CuSO_4$
38, 39, 40 Blank.		
59.	Sodium Carbonate	Na_2CO_3
61.	Sodium Hydroxide	NaOH

REAGENT BOTTLES

No.
37. Platinic Chloride ..... $PtCl_4$
58. Fehling's Solution
59. Sodium Carbonate ..... Na_2CO_3
60. Sodium Acetate ..... $NaC_2H_3O_2$
61. Sodium Hydroxide ..... $NaOH$
77. Ammonia ..... NH_3
81. Stannous Chloride ..... $SnCl_2$
82. Ammonium Molybdate ..... $(NH_4)_2MoO_4$
83. Carbon Disulphide ..... CS_2
86. Mercurous Nitrate..... $Hg_2(No_3)_2$
87. Indigo Solution
88. Nessler's Solution
90. Magnesia Mixture
93. Oxalic Acid ..... $H_2C_2O_4$
94. Picric Acid ..... $C_6H_2OH(NO_2)_3$
96. Potassium Chromate ..... K_2CrO_4

No.
97. Ammonium Sulphydrate .. NH_4HS
100. Mercuric Potassium Iodide
401. Barium Nitrate ..... $Ba(NO_3)_2$
404. Silver Sulphate ..... Ag_2SO_4
406. Bromine Water
407. Chloroform ..... $CHCl_3$
408. Cochineal
409. Coralline
410. Litmus
411. Methyl Orange
412. Phenolphtalein
413. Turmeric
414. Iodine Solution ..... 1+KI
415. Methyl Alcohol ..... CH_3OH
416. Sodium Cobaltic Nitrite
417. Sodium Hyposulphite..... $Na_2S_2O_3$

4102A **REAGENT BOTTLES.** 1 set of above 40 bottles, packed in shipping order, net $8.00
1 set of above 40 bottles, "Filled with chemically pure Reagents," according to Fresenius; bottles included. Prices on application.

4102B **REAGENT BOTTLES.** Capacity ½ pt. = 8 oz., 250 cc., height 6½ in., doz. ..... net $4.00

No.
101. Sulphuric Acid, Con..... H_2SO_4
102. Sulphuric Acid, Dil..... H_2SO_4
103. Nitric Acid, Con..... HNO_3
104. Nitric Acid, Dil..... NHO_3
105. Hydrochloric Acid, Con..... HCl
106. Hydrochloric Acid, Dil..... HCl
107. Hydrogen Sulphide (Amber).. ..... H_2S
108. Ammonium Hydroxide..... NH_4OH
109. Ammonium Chloride ..... NH_4Cl
110. Ammonium Carbonate ..... $(NH_4)_2CO_3$
111. Sodium Hydroxide ..... $NaOH$

No.
112. Sodium Carbonate ..... Na_2CO_3
114. Barium Chloride ..... $BaCl_2$
116. Blank
122. Ammonium Sulphide (Amber) ..... $(NH_4)_2S$
129. Sodium Phosphate ..... Na_2HPO_4
130. Ammonium Oxalate.... $(NH_4)_2C_2O_4$
131. Acetic Acid ..... $HC_2H_3O_2$
145. Silver Nitrate (Amber)..... $AgNO_3$
150. Potassium Hydroxide ..... KOH
151. Calcium Hydroxide ..... $Ca(OH)_2$
152. Lead Acetate ..... $Pb(C_2H_3O_2)_2$

4102C **REAGENT BOTTLES.** Capacity 1 pt. = 500 cc., height 7¾ in., dozen ..... net $5.00

No.
204. Ammonium Hydroxide .... NH_4OH
211. Blank
215. Sulphuric Acid ..... H_2SO_4
215A. Sulphuric Acid, Dil... H_2SO_4+Aq

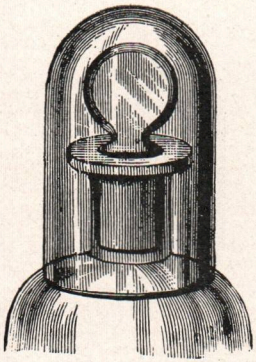
No.
216. Nitric Acid ..... HNO_3
216A. Nitric Acid, Dil..... HNO_3+Aq
217. Hydrochloric Acid ..... HCl
217A. Hydrochloric Acid, Dil..... ..... HCl+Aq

4102D **REAGENT BOTTLES.** Capacity 1 qt. = 1 litre, height 9½ in., dozen ..... net $6.50

No.
501. Sulphuric Acid, Con..... H_2SO_4
502. Sulphuric Acid, Dil..... H_2SO_4
503. Nitric Acid, Con. ..... HNO_3
504. Nitric Acid, Dil..... HNO_3

No.
505. Hydrochloric Acid, Con..... HCl
506. Hydrochloric Acid, Dil..... HCl
511. Blank

REAGENT BOTTLES



No. 4103A

4103A **REAGENT BOTTLES.** Capacity, 1 oz. = 30 cc., height, 3 5/8 in., per dozen ..... net $2.00

No.			No.		
325.	Silver Nitrate (Amber)	$AgNO_3$	336.	Gold Chloride	$AuCL_3$
326.	Cobaltous Nitrate	$Co(NO_3)_2$	341.	Blank.	
327.	Platinic Chloride	$PtCL_4$			

4103B **REAGENT BOTTLES.** Wide mouth, capacity, 1 oz. = 30 cc., height, 3 1/8 inches, per dozen ..... net $2.25

No.			No.		
350.	Sodium Carbonate	Na_2CO_3	367.	Potassium Chlorate	$KCLO_3$
351.	Borax	$Na_2B_4O_7$	368.	Potassium Ferricyanide	$K_3Fe(CN)_6$
353.	Sodium Acetate	$NaC_2H_3O_2$	369.	Sodium Bitartrate	$KaHC_4H_4O_6$
354.	Potassium Nitrate	KNO_3	370.	Sodium Nitrate	$NaNO_6$
358.	Potassium Cyanide	KCN	371.	Starch	
361.	Am. Sod. Phosphate	$NaNH_4HPO_4$	372.	Test Paper	
364.	Copper	Cu	373.	Zinc.	
365.	Ferrous Sulphate	$FeSO_4$	374.	Ammonium Phosphate	$(NH_4)_2HPO_4$
366.	Ferrous Sulphide	FeS	375.	Blank.	

4103C **REAGENT BOTTLES.** Wide mouth, capacity, 4 oz. = 125 cc., height, 4 7/8 inches, per dozen ..... net $3.50

No.			No.		
301.	Sodium Carbonate	Na_2CO_3	305.	Ferrous Sulphate	$FeSO_4$
302.	Potassium Nitrate	KNO_3	307.	Blank	
303.	Potassium Cyandie	KCN	312.	Test Paper.	
304.	Borax	$Na_2B_4O_7$	313.	Sod. Ammon. Phosphate	

4103D **REAGENT BOTTLE CAPS.** To protect stoppers and mouths of bottles from dust.

Size to fit bottles	oz. 4	8	16	32
Per dozen	$1.50	1.50	2.00	2.00

BOTTLES

No. 4104A

No. 4104B

No. 4104C

4104A **BOTTLES.** Narrow mouth, flint glass: S. C. "Prescriptions."

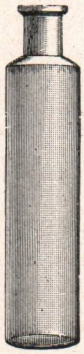
Capacity .....ounces	1	2	4	8	12	16	32
Price .....per dozen	$0.40	.50	.60	.75	1.25	1.50	2.00
Capacity .....gallons				½	1	2	5
Price .....each				$0.30	.50	1.50	2.50

4104B **BOTTLES.** Wide mouth, flint glass; S. C., "Powder Bottles."

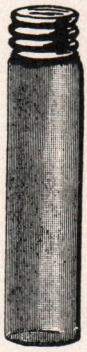
Capacity ....ozs.	½	1	2	3	4	8	12	16	32
Price ....per doz.	$0.40	.40	.50	.55	.60	.75	1.25	1.50	2.00

4104C **BOTTLES.** Extra wide mouth. Flint glass.

Capacity .....ounces	1	2	3	4
Price .....per dozen	$0.45	.55	.65	.70



No. 4104D



No. 4104F

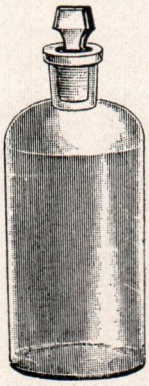
4104D **BOTTLES.** Extra tall, for oil samples and other liquids.

Capacity .....ounces	2	4	8
Price .....per dozen	$1.00	1.50	2.00

4104E **BOTTLES.** Oil sample, long, with N. P. screw cap, cork lined, 4 oz., dozen $2.50

4104F **BOTTLES.** With nickel screw caps, round.

Capacity .....drams	1	2	4	8
Price .....per dozen	$0.30	.35	.50	.75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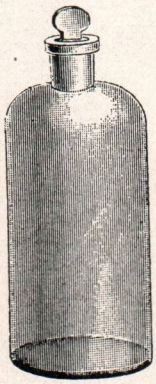
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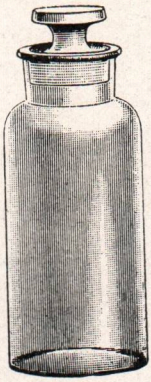
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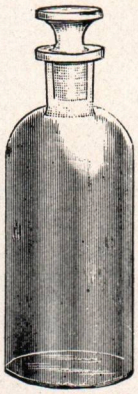

No. 4105D

4105A **BOTTLES, GLASS STOPPERED.** Flint glass, narrow mouth; S. C. "Tinctures."

Capacity ..oz.	1	2	4	6	8	12	16	32
Per doz.	$2.00	2.25	2.75	3.25	3.75	4.25	5.00	6.00

4105B **BOTTLES, GLASS STOPPERED.** Green glass; S. C. "Acid Bottles."

Capacity	8 oz.	1 pt.	1 qt.
Per dozen	$3.25	4.50	5.00
Capacity gallon	½	1	2
Each	$0.90	1.25	2.50

4105C **BOTTLES, MUSHROOM STOPPER.** Wide mouth; S. C. "Salt Mouths."

Capacity	1 oz.	2 oz.	4 oz.	6 oz.	8 oz.	12 oz.	16 oz.	32 oz.	½ gal.
Per doz.	$2.00	2.25	2.75	3.25	3.75	4.25	5.00	6.00	7.00

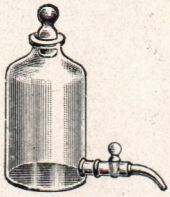
4105D **BOTTLES, MUSHROOM STOPPER.** Narrow mouth; S. C. "Tinctures."

Capacity ..ounces	1	2	4	8	16	32
Per dozen	$2.00	2.25	2.75	3.75	5.00	6.00
Capacity gallons				½	1	2
Each				$1.00	2.00	3.75

4105E **BOTTLES.** Same as above, but of amber glass, for solutions.

Capacity gallons	½	1	2
Each	$1.50	2.50	4.50

No. 4105G


No. 4105H

4105F **ASPIRATOR BOTTLES.** With narrow inlet near bottom, for rubber tubing.

Capacity	4 oz.	8 oz.	1 pt.	1 qt.	½ gal.	1 gal.	2 gal.
Each	$0.75	.90	1.10	1.40	2.00	3.50	6.25

4105G **ASPIRATOR BOTTLES.** With wide outlet near bottom.

Capacity	1 qt.	½ gal.	1 gal.	2 gal.	3 gal.
Each	$1.50	2.75	4.00	5.75	10.00

4105H **ASPIRATOR BOTTLES.** With glass stopper and stopcock ground into tubulature.

Capacity	1 pt.	1 qt.	½ gal.	1 gal.	2 gal.
Each	$4.00	6.00	7.50	9.00	14.00

BOTTLES

No. 4106A

No. 4106B

No. 4106D

4106A **BOTTLES, WOULFF'S.** With two necks.

Capacity	¼ pt.	½ pt.	1 pt.	1 qt.	½ gal.	1 gal.	2 gal.
Each	$0.80	.90	1.25	2.00	3.50	6.00	10.00

4106B **BOTTLES, WOULFF'S.** With three necks.

Capacity	¼ pt.	½ pt.	1 pt.	1 qt.	½ gal.	1 gal.	2 gal.
Each	$1.25	1.50	2.00	2.50	4.25	7.50	10.00

4106C **BOTTLES, WOULFF'S.** With three necks and tubulature near bottom.

Capacity	½ pt.	1 pt.	1 qt.	½ gal.	1 gal.	2 gal.
Each	$1.50	1.80	2.50	4.25	7.50	9.50

4106D **BOTTLES, DE-AERATING.** As used in sugar factories, for separating the air from the juice. Price on application.

No. 4106E

No. 4106F

No. 4106G

4106E **BOTTLES, WASH, DRECHSEL'S.** All glass, for gas, low form.

Capacity oz.	4	8	12	16	32
Each	$1.80	1.80	2.00	2.50	3.00

4106F **BOTTLES, WASH, ALLIHN'S.** All glass, for gas, double action.

Capacity oz.	8	16	32	64
Each	$3.00	3.75	4.50	6.00

4106G **BOTTLES, WOULFF'S.** With three necks, delivery tubes, and stopper ground in the necks.
Capacity, ounces, 4, 8, 16, 32.
Prices on application.

BOTTLES

No. 4107A

No. 4107B

No. 4107C

4107A **BOTTLES, BALSAM.** With glass cap and loose fitting stopper, capacity, 1 ounce. Each $0.35

4107B **BOTTLES, DROPPING OR ACID.** With ball stopper.

Capacity ..... oz.	1	2	
Each	$0.50	.55	

4107C **BOTTLES, COBALT.** With ground-on glass, and long stopper.

Capacity ..... oz.	1	2	4
Each	$0.35	.45	.60

No. 4107D

No. 4107E

No. 4107H

No. 4107G

4107D **BOTTLES, COIN OR ACID TEST.**

Capacity ..... oz.	1	2
Each	$0.50	.75

4107E **BOTTLES, DROPPING.** With pipette stopper and rubber bulb.

Capacity ..... oz.	1	2
Each	$0.45	.50

4107F **BOTTLES, DROPPING, BARNES.** With combination stopper and pipette.

Capacity ..... oz.	1	2
Each	$0.15	.25

4107G **BOTTLES, DROPPING, SCHUSTER'S.** With stopper.

Capacity ..... oz.	1	2
Each	$0.40	.60

4107H **BOTTLES, DROPPING.** Same as above, but without glass stopper.

Capacity ..... oz.	1	2
Each	$0.60	.80

BOTTLES

No. 4108A

No. 4108B

No. 4108C

No. 4108D

4108A **BOTTLES, DROPPING.** "Patent Stopper."

Capacity ..... oz.	1	2	
Each	$0.35	.45	

4108B **BOTTLES, MIXING.** Graduated and glass stoppered.

Capacity ..... cc.	250	500	1000	2000
Each	$1.50	2.25	4.50	7.00

4108C **BOTTLES, SPECIFIC GRAVITY.** Unadjusted, for self-adjustment, perforated stopper.

Capacity ..... cc.	10	25	50	100
Each	$1.00	1.20	1.50	2.00

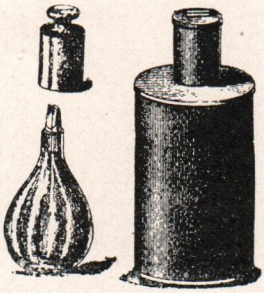
4108D **BOTTLES, SPECIFIC GRAVITY.** Accurately adjusted, perforated stopper.

Capacity ..... cc.	10	25	50	100
Each	$2.50	2.90	3.50	4.00

4108E **BOTTLES, SPECIFIC GRAVITY.** With thermometer ground in neck.

Capacity ..... cc.	25	50	100
Each	$3.00	3.50	4.50

No. 4108F



No. 4108G

No. 4108H

4108F **BOTTLES, SPECIFIC GRAVITY, GEISSLER'S.** With thermometer ground in neck, and capillary side tube.

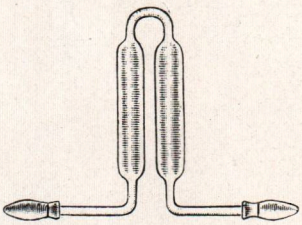
Capacity ..... cc.	25	50
Each	$9.00	9.50

4108G **BOTTLES, SPECIFIC GRAVITY.** With tare weight, in lacquered tin box.

Capacity ..... cc.	10	25	50	100
Each	$3.00	3.60	4.50	5.50

4108H **BOTTLES, SPECIFIC GRAVITY, REGNAULT'S.** With wide mouth for solids.
Capacity, cc., 25, 50.
Price on application.

BOTTLES



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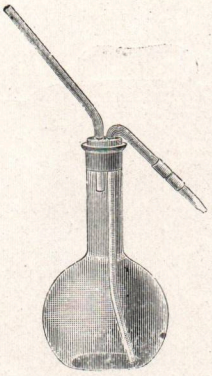


No. 4109B

No. 4109D

4109A **BOTTLES, SPECIFIC GRAVITY, SPRENGEL'S,** plain U shape with suction tube $3.65

4109B **BOTTLES, WASHING, FRESENIUS.** Complete with rubber stopper.

Capacity ..... oz.	4	8	12	16	24	32	64
Price ..... each	$0.55	.65	.80	1.00	1.25	1.50	2.00

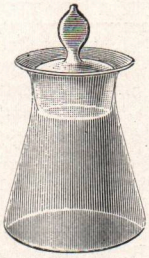
4109C **BOTTLES, WASHING, DRECHEL'S,** all glass.

Capacity ..... ounces	8	16	32
Price ..... each	$1.55	2.00	2.50

4109D **BOTTLES, WASHING, LANGBEIN'S,** with two glass stop-cocks.

Capacity ..... ounces	8	16	32
Price ..... each	$5.00	5.50	6.00

No. 4109E



No. 4109F

No. 4109G

4109E **BOTTLES, WEIGHING,** for Filters. Wide mouth and ground hollow stopper.

Height ..... mm.	50	50	50	65	75	100
Diam. ..... mm.	20	30	40	12	15	25
Price ..... each	$0.50	.60	.80	.50	.60	.80

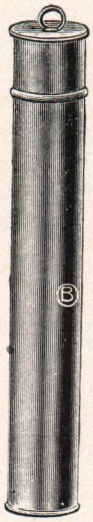
4109F **BOTTLES, WEIGHING,** conical form, with light stopper.

Capacity ..... ounces	1	2	4
Price ..... each	$0.80	1.00	1.20

4109G **BOTTLES, WEIGHING,** two tubes, one fitting into the other.

Length ..... mm.	70	75	80
Diam. ..... mm.	15	20	25
Price ..... each	$0.40	.50	.60

BOXES



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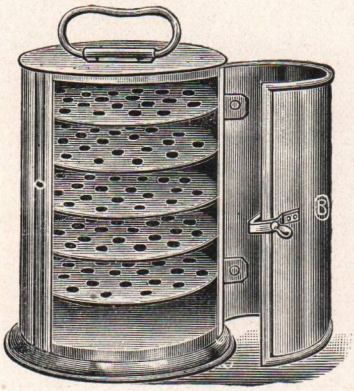


No. 4110I

No. 4110G

4110A **PIPETTE BOX,** of sheet copper, with overhanging cover, for sterilizing pipettes; size 4 x 4 x 12 inches. Type 1361 ..... $3.50

4110B **PIPETTE BOX,** same as above but made of sheet iron. Type 1362. Each 1.90

4110C **PIPETTE BOX,** of sheet copper, size 2 inches by 12 inches. Type 1363. Each 2.00

4110D **PIPETTE BOX,** of sheet iron, size 2 inches by 15 inches. Type 1364. Each 1.85

4110E **CULTURE-PLATE BOX,** sheet iron, for holding plates during sterilization and storing them until used, with deep, overhanging cover. Size 5½ inches by 2 inches by 7½ inches high. Type 1365. Price, each 1.50

4110F **CULTURE-PLATE BOX,** same as above, but of polished copper. Type 1366. Each 2.50

4110G **PETRI DISH HOLDER,** made of polished copper, with inside tray to lift out. Size 9 inches high by 4½ inches diameter. Type 1368. Price, each 4.50

4110H **PETRI DISH HOLDER,** same as above, but made of sheet iron. Type 1369. Price, each 3.50

4110I **PETRI DISH HOLDER,** round form, made of polished copper and nickel-plated, with five shelves, according to Dr. Pfuhl, for sterilization and sterile transportation of Petri and other glass dishes. Size 8 x 5 inches. Type 1371. Price, each 9.00

4110J **PETRI DISH HOLDER,** same as above, but square form. Size 7 by 5 by 5 inches. Type 1372. Price, each 8.75

4110K **BOXES, PASTE BOARD.** So-called pill boxes. Made of heavy stock, covered with white-glazed paper.

Diameter, inches	1 3/16	1 3/8	1½	2	2 3/8	2 3/4
Depth, inches	3/8	½	9/16	5/8	7/8	1 1/8
Number in original pkg.	36	36	35	36	36	36
Per dozen	$0.40	.35	.40	.45	.55	.60

Original package 10 per cent discount.

BRUSHES

BRISTLE MARKING BRUSHES

No. 4111A

ROUND WHITE BRISTLE MARKING BRUSHES

4111A **WHITE FRENCH BRISTLES, PLAIN CEDAR HANDLES,** Type 610.

1	Diameter $\frac{3}{32}$ inch	each	$0.10
2	Diameter $\frac{1}{8}$ inch	each	.10
3	Diameter $\frac{3}{16}$ inch	each	.10
4	Diameter $\frac{7}{32}$ inch	each	.10
5	Diameter $\frac{1}{4}$ inch	each	.10
6	Diameter $\frac{9}{32}$ inch	each	.10

SMOOTHING BRUSHES

No. 4111B

SOLID BLOCKS

4111B 10 inches, Black Tampico, length of fibre 2 inches. Type 880.
Each $0.50

4111C 12 inches, Black Tampico, length of fibre 2 inches. Type 881.
Each ..... .75

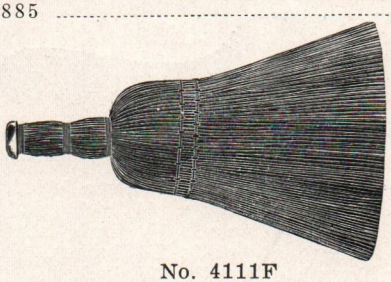
(White Tampico will be furnished if so desired.)

No. 4111D

WIRE DRAWN

4111D 10 inches, Stiff Black China Bristle, length of bristle 2¼ inches.
Type 884 ..... $3.00

4111E 12 inches, Stiff Black China Bristle, length of bristle 2¼ inches.
Type 885 ..... 3.60



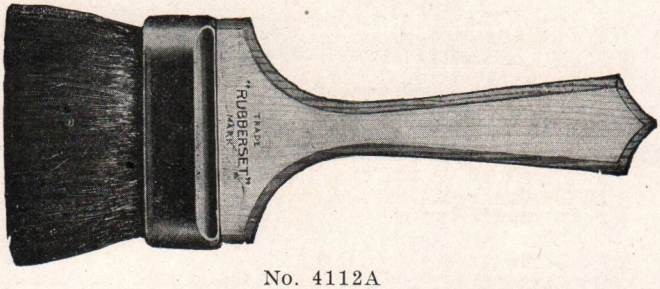
No. 4111F

4111F **BROOMS, CORN, WHISK.** Extra quality, light weight.....doz. $2.50

4111G **BROOMS, WHISK.** Amalgam, extra heavy, for cleaning plates
Dozen 3.00

"RUBBERSET" CAMEL HAIR COLOR BRUSHES

RUBBER BOUND



No. 4112A

4112A Single thick, set in rubber, flat handles. Type 68.

1 inch,	length of bristle 1 inch	each	$1.40
1 ½ inches,	length of bristle 1 ¼ inches	each	2.15
2 inches,	length of bristle 1 ⅜ inches	each	3.05
2 ½ inches,	length of bristle 1 ½ inches	each	4.10
3 inches,	length of bristle 1 ⅝ inches	each	5.30

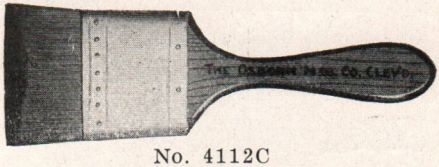
CLEANING BRUSHES

No. 4112B

4112B Black China bristle, nickel-plated bands, red handles. Type 485.

3 inches,	length of bristle 3 inches	each	$0.90
3 ½ inches,	length of bristle 3 ¼ inches	each	1.10
4 inches,	length of bristle 3 ½ inches	each	1.50
4 ½ inches,	length of bristle 3 ½ inches	each	1.75
5 inches,	length of bristle 3 ¾ inches	each	2.50

CAMEL HAIR MOTTLING BRUSHES



No. 4112C

4112C Single thick, fine quality, tin bound. Type 560.

½ inch,	length of bristle 15/16 inch	each	$0.20
¾ inch,	length of bristle 1 inch	each	.25
1 inch,	length of bristle 1 1/16 inches	each	.30
1 ½ inches,	length of bristle 1 ⅛ inches	each	.40
2 inches,	length of bristle 1 3/16 inches	each	.50
2 ½ inches,	length of bristle 1 ¼ inches	each	.70
3 inches,	length of bristle 1 ⅜ inches	each	1.05

BRUSHES

No. 4113A

CLEANING BRUSHES

4113A Selected black China bristles, very elastic, vulcanized in rubber cement, nickel bound, oval handles. Type 435.

3 inches, length of bristle 3 ¾ inches	each	$1.40
3 ½ inches, length of bristle 4 inches	each	1.95
4 inches, length of bristle 4 ¼ inches	each	2.40
4 ½ inches, length of bristle 4 ¼ inches	each	2.65
5 inches, length of bristle 4 ¼ inches	each	3.00

"GUM TITE" FLAT BRUSHES
Vulcanized in Rubber Cement

No. 4113B

CHISELLED BLACK BRISTLE BRUSHES, SINGLE THICK

4113B Selected black China bristle, vulcanized in rubber cement, tin ferrules, flat handles. Type 444.

1 inch, length of bristle 1 ½ inches	each	$0.20
1 ½ inches, length of bristle 1 ⅝ inches	each	.30
2 inches, length of bristle 1 ⅞ inches	each	.40
2 ½ inches, length of bristle 2 ⅛ inches	each	.50
3 inches, length of bristle 2 ⅜ inches	each	.70

"RUBBERSET" FLAT GLUE BRUSHES, RUBBER BOUND

No. 4113C

4113C Grey Russia bristle, set in rubber, flat handles. Type 45.

3 inches, length of bristle 3 ⅞ inches	each	$2.00
3 ½ inches, length of bristle 3 ⅛ inches	each	2.50
4 inches, length of bristle 3 ¼ inches	each	3.00
4 ½ inches, length of bristle 3 ⅜ inches	each	3.50
5 inches, length of bristle 3 ½ inches	each	4.25

BRUSHES

GLASS BRUSH

No. 4114A

Solid Blocks, Staple Set

4114A Prepared Stiff Bristle, 2¾ inches diameter, 8 rows. Type 78. Each $0.75

4114B Prepared Stiff Bristle, 3 inches diameter, 10 rows. Type 79. Each 1.00

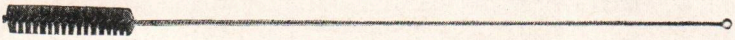
GLASS BRUSH

No. 4114C

Wire Bound, for Glasses

4114C Grey American Bristle, 2½ inches diameter. Type 9. Each..... $0.35

BURETTE BRUSH



No. 4114D

4114D White American bristle. Type 176. Brush part 4½ inches long, wire handle 36 inches long, 40 ½ inches long over all. Brush part ⅜, ½, ⅝, ¾, ⅞ or 1 inch diameter. Each.... $0.20

PLATERS' BRUSHES

FINE WIRE HAND BRUSHES

No. 4114E

Curved Handles, Brass Wire Drawn

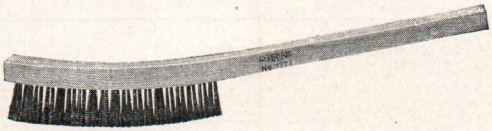
These Brushes can be made with either curved or straight handles. Unless otherwise specified, curved handle brushes (as shown by illustration) will always be furnished. Length of brush part 5½ inches, length of wire 1 inch, length over all 12 inches. Fine steel wire.

4114E 3 rows, width of block ⅞ inch. Type 0251A..... each $1.25

4114F 4 rows, width of block 1⅛ inches. Type 0252A..... each 1.50

BRUSHES

CURVED HANDLE BRUSHES



No. 4115A

Solid Blocks

4115A 3 rows, length of wire 1⅛ inches, block 14x$\frac{15}{16}$ inches, length of brush part 6 inches. Type 1777 ..... each $0.50

CASTING BRUSH

No. 4115B

Solid Blocks

Made of first quality tempered flat steel wire on well finished hardwood blocks. They are strong and durable and will withstand severe use.

4115B 5x10 rows, length of wire 1¼ inches, block 7¾x2⅝ inches. Type 105 ..... each $0.50

JAR BRUSH

No. 4115C

4115C Black China brustles, brush part 3¼ inches diameter, 6 inches long, hickory handle $\frac{9}{16}$ inch diameter, 9 inches long. Type 73 ..... each $0.75

GLASS BRUSH

No. 4115D

Wire Wound

4115D Grey American bristle, 2½ inches diameter. Type 11 ..... each $0.50

BRUSHES

PUSH BROOM HANDLES

No. 4116A

These Handles are especially selected for use with our Push and Upright Brooms, the ends being chucked to fit the handle holes in the Brooms. Unless otherwise specified, No. 120 Handles are regularly furnished.

4116A 4⅓ ft. long, 1⅛ inches diameter, hardwood. Type 120.....each $0.15
4116B 5 ft. long, 1 3/16 inches diameter, hardwood. Type 121.....each .20
4116C 6 ft. long, 1¼ inches diameter, hardwood. Type 122.....each .25

We call particular attention to the fact that handles are not regularly furnished with any of our Push Brooms, Upright Brooms, Floor Scrapers, Deck Scrubs, etc. If handles are wanted, they should always be ordered as a special item.

CURVED BACK WIRE BRUSH

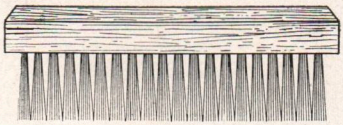
No. 4116D
Solid Blocks

The curved face of these Brushes increases their efficiency, as it gives greater leverage than is possible with the ordinary straight or flat face Brushes.

Curved Back Brushes are made of tempered fine round steel wire.

4116D Block 7x3 inches, 9x21 rows, length of wire 1¼ inches. Type 1779 .....each $0.75

STRAIGHT BACK WIRE BRUSH



No. 4116E
Solid Blocks

4116E Block 7¼x2¼ inches, 6x19 rows, length of wire 1¾ inches. Type 1780 .....each $0.75

SHOE HANDLE BRUSHES

No. 4116F
Solid Blocks

4116F 2 rows, length of wire 1⅛ inches, length of brush part 5¼ inches. Type 1784.....each $0.50
4116G 4 rows, length of wire 1⅛ inches, length of brush part 5¼ inches. Type 1781.....each .50
4116H 4 rows, length of wire 1 3/16 inches, length of brush part 5 inches, finer wire than Type 1781, heavily filled. Type 283....each .75

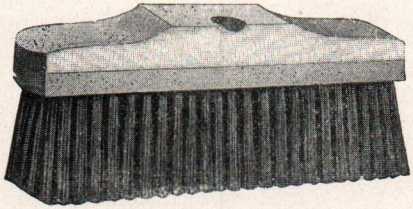
FLAT WIRE PUSH BROOMS

Made of Tempered Flat Steel Wire

No. 4117A

4117A	Block 12x2 ⅜ inches, 4 rows, length of wire 5 inches.	Type 120..	$0.75
4117B	Block 14x2 ⅜ inches, 4 rows, length of wire 5 inches.	Type 121..	.90

ROUND STEEL WIRE PUSH BROOMS



No. 4117C

Round Steel Wire Push Brooms are excellent for scrubbing cement floors, cellars, yards, etc., and for sweeping on rough wooden or stone floors. They are largely used by brewers and malsters. Made of tempered fine round steel wire.

4117C Block 12x3 inches, 8 rows, length of wire 2½ inches. Type 146 ..... each $2.00

EXTRA LONG PUSH BROOMS

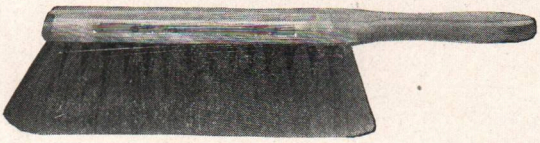
No. 4117D

Solid Blocks. Split Bamboo. Length of Fible 7 inches.

4117D	Block 20x3½ inches, 5 rows.	Type 0289	each	$1.40
4117E	Block 22x3½ inches, 5 rows.	Type 0294	each	1.75
4117F	Block 24x3½ inches, 5 rows.	Type 0299	each	2.00

BRUSHES

COUNTER OR BENCH DUSTERS



No. 4118A

These Brushes will be found unusually serviceable for general dusting purposes. For many uses they are superior to the dusters with flared ends as stock is more compact on the face or brushing surface.

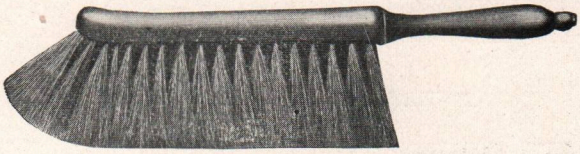
Extra Stiff, Pure Black Hair. Solid Natural Polished Handles, Staple Set.
4118A 9 inches, length of hair 2 7/8 inches. Type 427.....$1.25

No. 4118B

Black Bristle Body, White Bristle Casing.

Solid Red Polished Handles, Set in Cement.

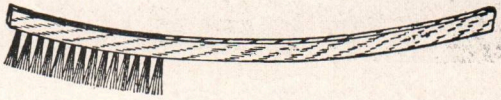
4118B 8 inches, length of bristle 2 inches. Type 440.....$0.75



No. 4118C

Pure Black China Bristle. Solid Red Polished Handles, Set with Cement.
4118C 8 inches, length of bristle 2 7/8 inches. Type 392.....$1.50

JONES SAMPLE BRUSH



No. 4118D

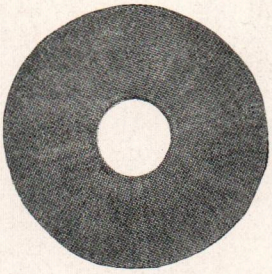
These Brushes were especially designed for cleaning chains and gears of automobiles, motorcycles, bicycles, etc.

4118D 1 row, black China bristle, length of bristle 7/8 inch. Type 285....$0.25

"ECONOMY" WIRE WHEEL BRUSHES

SECTIONS OR FILLERS

Patented June 5, 1906



No. 4119A

One "Economy" Section

STEEL WIRE SECTIONS FOR "ECONOMY" WHEEL BRUSHES

	Type		For Hub No.	Diam. of Sections, Inches	Sections Per Set	Wire No.	List Per Set
4119A	*3314	Steel	50C	15	6	33	$7.50
4119B	*3411	Steel	53C	12	5	34	6.00
4119C	*358	Steel	54C	10	5	35	5.50
4119D	*364	Steel	55C	8	4	36	4.30
4119E	*373	Steel	56C	7	4	37	3.60
4119F	392½	Steel	57C	6	4	39	3.20

CASTING BRUSHES

No. 4119G

Solid Blocks

Made of first quality, tempered flat steel wire on well finished solid hardwood blocks; strong and durable, and will withstand the severest use.

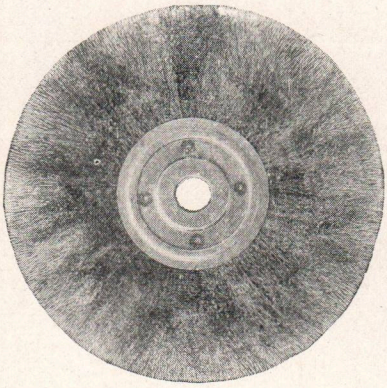
.017x.059 tempered flat steel wire—5 wires doubled per hole.

PRICE

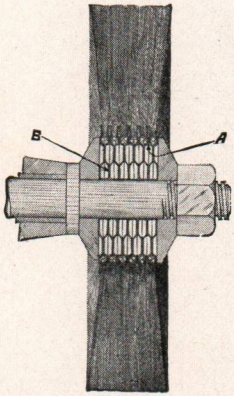
4119G 5x10 rows, length of wire 3 inches, block 7¾x2⅝ inches. Type 6 ..... each $0.50

4119H 5x10 rows, length of wire 4 inches, block 7¾x2⅝ inches. Type 7 ..... each .60

"MONITOR" WIRE SECTIONS



Complete Section



Cross Section View
Showing Six Sections, Mounted

"MONITOR" Sections are especially designed to provide a convenient and practical method of building a wheel of any desired width of face, without the use of a Hub.

Each Section is a complete Wheel in itself, and can be mounted directly on a shaft or spindle.

The cross section view shows the construction and the relative position of several sections when mounted together between the flanges of an Emery Grinder.

The Wire Brush part is formed on a continuous stem, encased between two steel discs, securely welded together, and having broad contacts at points "A" and "B." By this method, we are enabled to build up a solid, compact Brush in which, by reason of the broad contacts, each section will remain rigid and in its original position.

"MONITOR" STEEL WIRE SECTIONS

No Hubs Necessary

	Type	Outside Diameter, Inches	Diameter Face Plates, Inches	Size of Wire No. of Gauge	Size of Wire Decimal, Inches	Price Per Section
4120A	3356	15	6	33	.011	$1.50
4120B	3444	12	5	34	.010	1.40
4120C	3532	10	5	35	.0095	1.30
4120D	3616	8	4	36	.009	1.20
4120E	3712	7	3	37	.0085	1.10
4120F	3910	6	3	39	.0075	1.00

When ordering, state size of arbor hole desired.

The following is a list of the various sizes of arbor holes regularly furnished in the different sizes of "MONITOR" Sections, listed above.

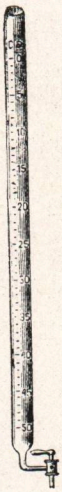
	Type	Diameter	Sizes of Arbor Holes Regularly Made
4120G	3356	15	¾, 1, 1¼, 1½, 1¾, 2 and 2½ inches
4120H	3444	12	¾, 1, 1¼ and 1½ inches
4120I	3532	10	¾, 1, 1¼ and 1½ inches
4120J	3616	8	½, ¾, 1, 1¼ and 1½ inches
4120K	3712	7	½, ¾ and 1 inch
4120L	3910	6	½, ¾ and 1 inch

BURRETTES

No. 4121A

No. 4121B

No. 4121C



No. 4121D

4121A **BURRETTES, MOHR'S.** Most accurately graduated, for pinch-cocks; with tip and rubber connection.

Capacity ..... cc.	10	25	50	100	100
Graduated in ..... cc.	1–10	1–10	1–10	1–5	1–10
Each	$0.50	.70	.90	1.65	1.80

4121B **BURETTES, MOHR'S.** With side filling tube, for pinch-cocks, with tip and rubber connection.

Capacity ..... cc.	10	25	50	100	100
Graduated in ..... cc.	1–10	1–10	1–10	1–5	1–10
Each	$0.50	.60	.90	1.30	1.50

4121C **BURETTES, MOHR'S.** With Geissler's glass stopcock.

Capacity ..... cc.	10	25	50	100	100
Graduated in ..... cc.	1–10	1–10	1–10	1–5	1–10
Each	$1.70	2.25	2.75	3.50	3.75

4121D **BURETTES, FRESENIUS'.** With glass stopcock.

Capacity ..... cc.	10	25	50	100
Graduated in ..... cc.	1–10	1–10	1–10	1–10
Each	$1.75	2.10	2.40	3.45

4121E **BURETTES, GAWALOWSKY'S.** With glass stopcock and glass side tube with stopcock, for filling from reservoir.

Capacity ..... cc.	25	50	100
Graduated in ..... cc.	1–10	1–10	1–10
Each	$5.00	5.50	7.25

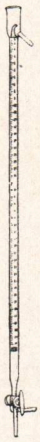
BUCKING BOARDS. See Crushers.

BULBS, RUBBER. See Rubber Goods.

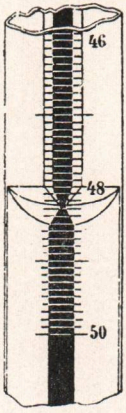
BULBS, POTASH. See Potash Bulbs.

BURRETTES

No. 4122A

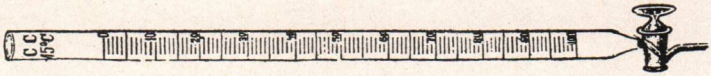


No. 4122B



No. 4122C

No. 4122F



No. 4122G

4122A **BURETTES.** With 3-way glass stopcock and tube for filling from reservoir.

Capacity ..... cc.	25	50	100
Graduate ..... cc.	1–10	1–10	1–10
Each ..... cc.	$9.00	10.50	12.75

4122B **BURETTES, AUTOMATIC.** With zero point and overflow reservoir.

Capacity ..... cc.	25	50	100
Graduate ..... cc.	1–10	1–10	1–10
Each	$6.00	7.50	8.50

4122C **BURETTES, SHELLBACH'S.** Same as above..... $6.50 8.00 8.50

4122D **BURETTES, SHELLBACH'S.** With dark enameled stripe on white enamel background, giving a definite meniscus; with tip and rubber connection.

Capacity ..... cc.	25	50	100
Graduate ..... cc.	1–10	1–10	1–10
Each	$3.20	3.50	4.50

4122E **BURETTES, SHELLBACH'S.** With glass stopcock.

Capacity ..... cc.	25	50	100
Graduate ..... cc.	1–10	1–10	1–10
Each	$4.25	5.00	6.00

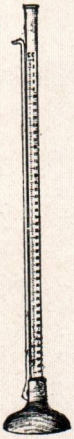
4122F **BURETTES, SHELLBACH'S.** With three-way stopcock.

Capacity ..... cc.	25	50	100
Graduate ..... cc.	1–10	1–10	1–10
Each	$4.50	5.50	6.50

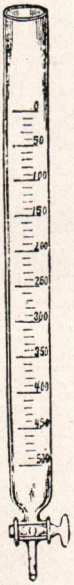
4122G **BURETTES.** With absolutely tight stopcock, bored at an angle of 45 degrees.

Capacity ..... cc.	25	50	100
Graduate ..... cc.	1–10	1–10	1–10
Each	$3.00	4.00	6.00

BURRETTES



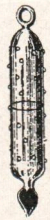
No. 4123A



No. 4123B

No. 4123D

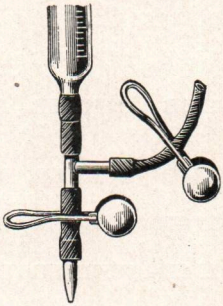
No. 4123E



No. 4123F

No. 4123H

No. 4123J



No. 4123I

4123A **BURETTES, GAY LUSSAC'S.** On polished wood base.

Capacity	cc. 25	50	100
Graduate	cc. 1–10	1–10	1–5
Each	$2.50	3.50	5.00

4123B **BURETTES, DISPENSING.** With glass stopcock. For liquids in large quantities.

Capacity	cc. 250	500	1000
Each	$3.50	4.50	6.00

4123C **BURETTES.** Same as above, but without stopcock.

Capacity	cc. 250	500	1000
Each	$3.60	4.40	6.20

4123D **BURETTE CAPS.** To protect contents from dust, assorted..doz. $1.80

4123E **BURETTE FLOAT, ERDMANN'S**.....each .75

4123F **BURETTE FLOAT, VOLHARD'S.** With points to prevent alhering to walls.....each 1.10

4123G **BURETTE FLOAT, BEUTELL'S**.....each 1.00

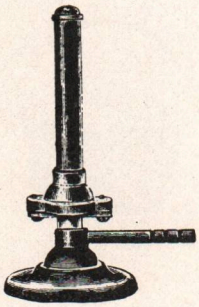
4123H **BURETTE TIPS,** per dozen..... 1.00
Per 100 ..... 6.00

4123I **BURETTE ATTACHMENT.** Three-way, connecting any burette with reservoir, for refilling.....each .75

4123J **BUCKETS, AMALGAM OR QUICKSILVER.** Of iron, white enamel inside.

Capacity ..... qts.	2	3	4	6	8	12
Each	$0.90	1.25	1.35	1.70	2.00	2.75

BURNERS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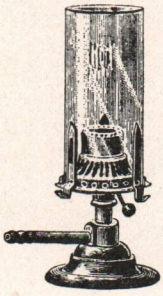
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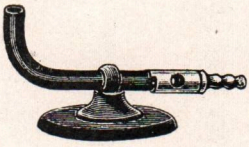
No. 4124D


No. 4124E

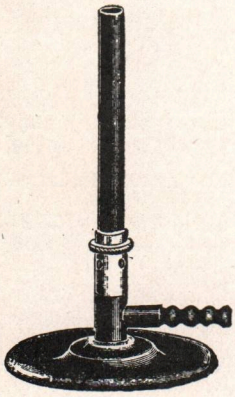
4124A **BURNER, BUNSEN.** For acetylene gas; height, 6 inches; diameter of tube, $\frac{9}{16}$ inch. Type 2117 ..... $2.25

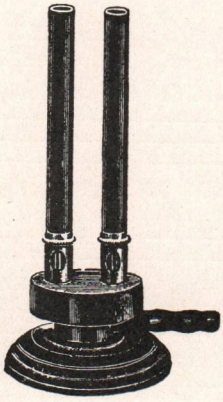
4124B **BURNER, ARGAND.** Low form, with glass chimney, 7 inches high. The flame is adjustable, can be turned very low. Type 2118 ..... 1.60

4124C **BURNER, ARGAND.** Same as above, but with iron chimney, 4 inches high; very useful for heating purposes. Type 2119 .. 1.60

4124D **BURNER, BUNSEN.** Small form, nickeled; 2 inches high, tube $\frac{3}{16}$ inch diameter. Type 2195 ..... .75

4124E **BURNER, BUNSEN.** Low shape, with air regulator. Type 2250 .75


No. 4124F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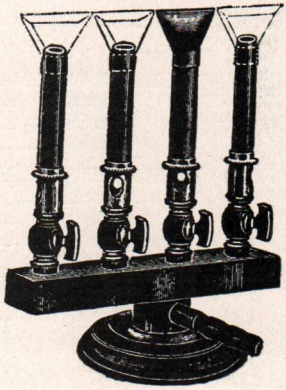

No. 4124L

4124F **BURNER, BUNSEN.** Usual size, with air regulator. Type 2200 .. $0.50

4124G **BURNER, BUNSEN.** Large tube, ½ inch diameter. Type 2205 .. .65

4124H **BURNER, BUNSEN.** With 2 tubes, and air regulators. Type 2210 ..... 1.90

4124I **BURNER, BUNSEN.** With 3 tubes, and air regulators. Type 2215 ..... 2.50

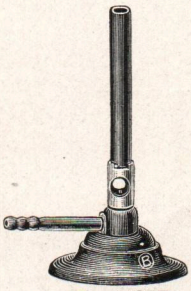
4124J **BURNER, BUNSEN.** With 4 tubes, and air regulators. Type 2220 ..... 3.00

4124K **BURNER, BUNSEN.** With 4 tubes in one row. Type 2240 ..... 4.50

4124L **BURNER.** Same as Type 2240, with stopcocks. Type 2243 ..... 6.75

BURNERS

No. 4125A



No. 4125B

4125A **BURNER, BUNSEN.** Self-adjusting Bunsen Burner, for burning gases of various qualities. Type 2130.

The special features of this burner are the following:

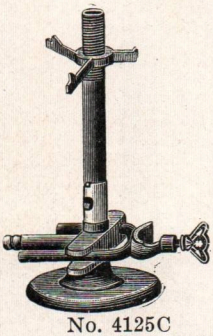
By turning the knurled part, you can increase or lower the flame, the flow of gas and air being regulated automatically, and therefore the burner will always retain a blue flame.

The supply of air is regulated by inserting the screw into the next slot, either to the right or to the left. Care must be taken that the screw is not inserted into the slot too tightly, as his will interfere with the turning of the burner.

If a yellow flame should be desired, separate the set-screw from burner-tip, allowing the gas and air to be regulated separately. This is the best self-adjusting Bunsen burner made, and we can recommend it to give entire satisfaction. Height 6 inches, diameter of tube, ½ inch.

Each $2.00

4125B **BURNER, BUNSEN.** For gasoline gas. Type 2200 ..... 1.50



No. 4125C

No. 4125E

4125C **BURNER, BUNSEN.** With fork to attach to ring stand, and star for chimney. Type 2247. Each $2.00

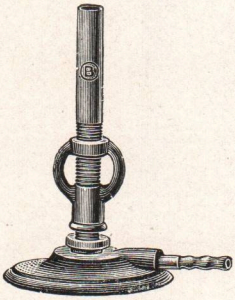
4125D **BURNER, BUNSEN.** With small constant flame, for relighting with stopcock. Each 2.50

4125E **BURNER, CHADDOCK'S.** Of porcelain, incorrodible; for use in hoods where metal on account of the smoky flame, soon corrodes. Complete with support for dishes, chimney and 3 asbestos pads 3.25

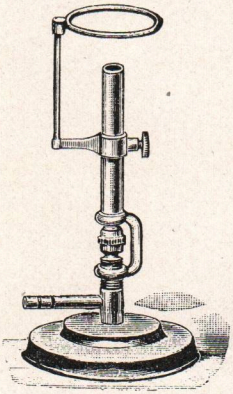
Castle Tops ..... .60

Castle Rings ..... .25

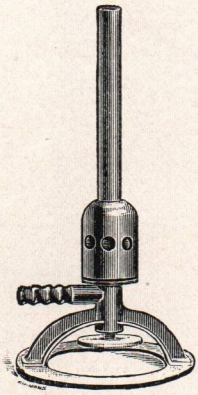
BURNERS



No. 4126A



No. 4126B



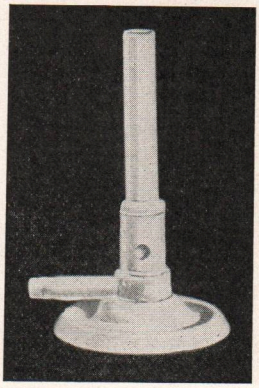
No. 4126D

4126A **BURNERS, DETROIT STYLE.** For gasoline gas. Type 2121....$1.30

4126B **BURNERS, BUNSEN, ADJUSTABLE.** Its adjustability renders it a favorite burner for those using gasoline gas, or the mixture of gasoline vapor and air made by gas machines. Type 59 ..... 1.75

4126C **BURNERS.** Same as No. 4126B, but with adjustable support. Type 5K 2.50

4126D **BURNERS, TIRRIL'S.** For gasoline gas; very highly recommended. Type 2123..... 2.25



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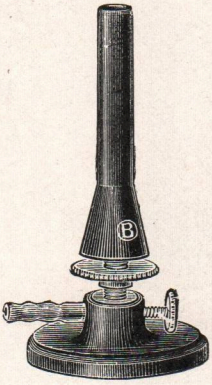


No. 4126F

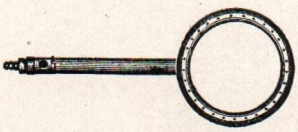
4126E **BURNERS, BUNSEN,** complete. Porcelain. Height 150 mm. Type 670. Price each.....$2.45

BURNERS, TECLU'S, giving a large and powerful flame.

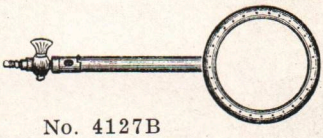
4126F Small size, each..... 1.25

4126G Large size, each..... 2.00

BURNERS AND BLAST LAMPS



No. 4127A



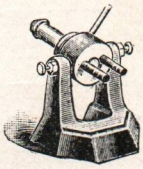
No. 4127B

4127A **BURNERS.** Ring form, for heating funnels, etc., may be attached to a support.

Diameter ....inches	3	4	5	6
Each	$1.60	1.75	2.00	2.25

4127B **BURNERS.** Same as above, with stopcock.... $2.50 2.65 2.75 3.10

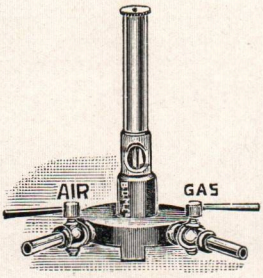
No. 4127C



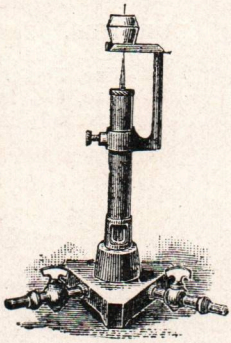
No. 4127D

4127C **BLAST LAMPS, BUNSEN.** For gas. Improved form, complete with set of 3 tips.... $ 4.75

4127D **BLAST LAMP OR COMPOUND BLOW PIPE.** Improved form —made on the principle of a stopcock, having a ground key, consequently there is no leakage of gas, as on others. From a delicate pointed jet to a large powerful flame can be obtained by a movement of the lever which adjusts both air and gas automatically. The pilot light may be kept burning continually if desired. Type 1987....each 12.00



No. 4127E



No. 4127F

4127E **BLAST LAMPS, FLETCHER'S.** With upright blast. Type 5.....$4.50

Accessories for Above.

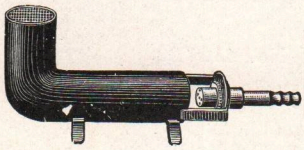
4127F **BLOW PIPE FURNACES.** With bottom or side hole, and 1 crucible .... .50

4127G **CLAY CRUCIBLES,** ¾-inch diameter, per dozen.... .40

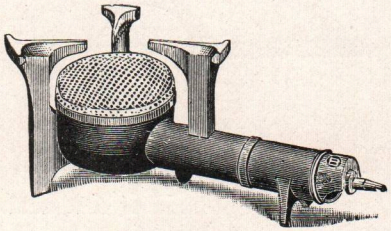
4127H **CLAY CAPSULES,** per dozen.... .40

4127I **FURNACE SUPPORTS** 1.20

BURNERS



No. 4128A



No. 4128B

4128A **BURNERS.** Low shape, extra large, with gauze top, height 5 inches, diameter 2¼ inches, extreme length 14 inches. Type 2256 ..... $2.65

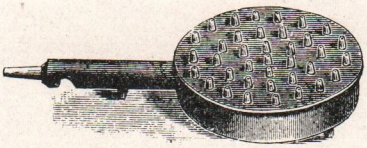
4128B **BURNERS.** Solid flame, small, 3 inches in diameter 1.50

4128C **BURNERS.** Solid flame, large, 4 inches in diameter 2.10

4128D **BURNERS, FLETCHER'S.** Solid flame. For gasoline gas, with wheel valve. Type 47.

Size	Small No. 47	Large No. 46B
Each	$3.00	$4.25

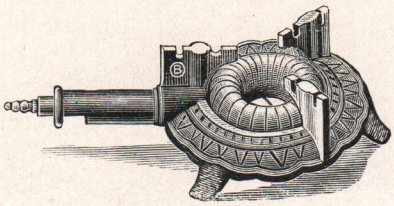
4128E **EXTRA GAUZE TOPS.** For above, small $0.35 each, large $0.40 each.



No. 4128F

4128F **BURNERS.** Cast iron evaporating.

Size, 4 inches	$2.70
Size, 5 inches	3.25
Size, 6½ inches	4.10
Size, 9¼ inches	5.70



No. 4128G

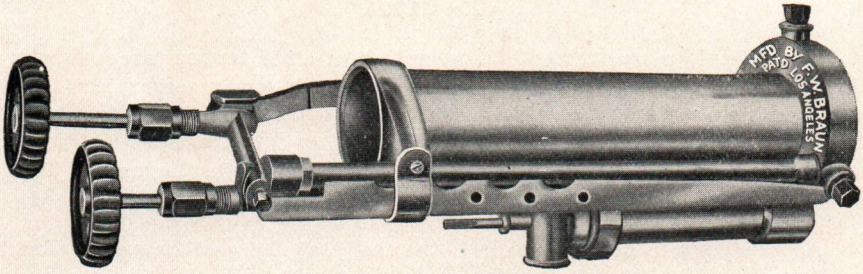
4128G **BURNERS, FLETCHER'S RADIAL.**

		1R	2R
Ring diam.	in.	3¾	5
Price	each	$2.25	3.20

4128H **BURNERS, FLETCHER'S RADIAL.** For gasoline gas, wheel valve regulator.

Ring diam.	in.	3¾	5
Price	each	$3.50	4.25

CARY HYDROCARBON BURNERS



No. 4129A

ARRANGED FOR BURNING IN ENCLOSED CHAMBERS, SUCH AS FURNACES, ETC.

Type 2815

Perfect combustion requires a mixture of carbon, hydrogen, and oxygen in certain proportions, heated to the proper temperature. To obtain these results it is necessary that each individual burner may be adjusted in such a manner that a correct mixture is made. The Cary Hydro-Carbon Burner is the only one on the market with mechanical construction that admits of this adjustment, and the only one that allows no air to enter the furnace except through the mixing tube, where it is thoroughly mixed with the vaporized gasoline.

Owing to perfect combustion, the Cary Burner consumes more exygen than other burners, and therefore the products of combustion in the shape of gases are greater. As this is the case, and as each burner is adapted in a manner to attain the most satisfactory results with no air entering the furnace except through the burner tube, it will be seen that this burner is best suited to furnaces having special burner holes and large chambers around the muffle, such as the Cary Furnace. While it may burn with other types of furnaces, it is not as satisfactory.

Perfect combustion means intense heat, and some users of the Cary Burner claim to reach the melting point of platinum. The flame is clean, gives off neither poisonous nor noxious fumes, and is almost noiseless.

Prices are net F. O. B. Denver, Salt Lake, El Paso or Los Angeles.

Agents for Braun Laboratory Appliances.

CARY HYDROCARBON BURNERS

No. 4130A

The difficulties encountered in generating in other burners are overcome in this by use of a separate valve and trough. Generation is accomplshed by permitting a small quantity of gasoline to flow into this trough, and igniting; the flame envelopes the burner, and quickly heats it to a temperature which admits opening the main needle valve and allowing the flame to be thrown into the furnace.

Another feature of this burner is the fact that the gasoline passes through a filter consisting of a tube having a screen at each end, and filled with clean gravel, to remove any solid matter which may be in the gasoline and prevent clogging the burner face. The gasoline passes entirely around the interior of the burner face, a feature which is found in no other assay burner except our Sunset, and which insures entire vaporization of the fuel.

The clean flame resulting from perfect combustion does not eat away or corrode the face of the burner. In this respect the Cary Burner is practically indestructible.

The size of the burner is determined by the outside diameter of the mixing tube.

FUEL CONSUMPTION

The fuel consumption of the different size Burners will vary according to the air pressure used on the oil. When from 35 to 40 pounds pressure is used the consumption will be as follows:

1½-inch burner, ½ gallon per hour.
1¾-inch burner, ¾ gallon per hour.
2 -inch burner, 1 gallon per hour.
2¼-inch burner, 1¼ gallon per hour.

Full and complete instructions accompany each burner sent out.

PRICES AND DIMENSIONS

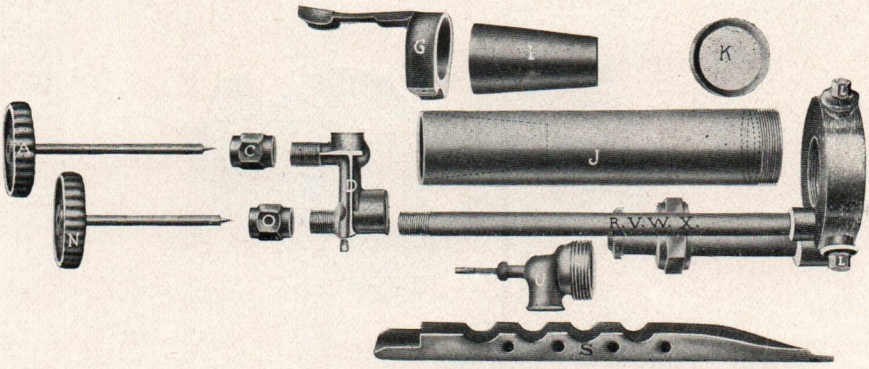
	Size, Inches	Length, Inches	Net Wt., Pounds	Shipping Wt., Pounds	Price
4130A	1½	13½	3⅞	5	$13.00
4130B	1¾	14	4⅛	6½	14.00
4130C	2	15½	4¾	7	15.50
4130D	2¼	17	5⅝	7½	17.00

See Next Page for Renewal parts of Cary Burners.

Prices are net F. O. B. Denver, Salt Lake, El Paso or Los Angeles.

Agents for Braun Laboratory Appliances.

CARY HYDROCARBON BURNERS



No. 4131A

RENEWAL PARTS

For all sizes up to and including 2¼ inch.

A—Main Needle Valve	$0.50
C—Packing Nut	.25
CC—Complete Elbow and Valves, consists of A, C, D, N, O	3.00
D—Elbow Casting	1.50
G—Collar and Brace for Mixing Tube	1.00
I—Cone inside of Mixing Tube	1.00
J—Mixing Tube	2.50
K—Retaining Ring	1.00
L—Face Screws	$0.10
N—Generating Needle Valve	.50
O—Packing Nut	.25
RVWX—Face with Feed Tube and Intake Tube brazed in	8.00
S—Generating Trough	1.25
U—Elbow for Gasoline Intake Tube, with Adjusting Valve	1.50
V—Union Nut	.50

BURNER BOSS

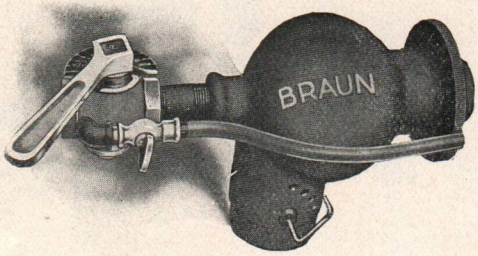
4131B This is a fire clay boss or ring, which we furnish all the furnaces supplied by us when it is known they are to be used with a Cary Burner. The function of this boss is to obtain a burner opening in the furnace of the correct size for the burner employed, and one which will have an even surface against which the burner may be adjusted. The reason for using the following exact dimensions is that these sizes allow the greatest possible area of the burner face to be exposed to the reflected heat from the interior of the furnace, and yet are small enough to prevent the admission of the air to the furnace, excepting that drawn through the mixing tube of the burner by the injected vapor.

	Inside Diam.	Each
Cary Burner, size 1½ in., should have a boss	2¾ in.	$0.25
Cary Burner, size 1¾ in., should have a boss	2⅞ in.	.25
Cary Burner, size 2 in., should have a boss	3⅛ in.	.25
Cary Burner, size 2¼ in., should have a boss	3⅜ in.	.25

Prices net F. O. B. Denver, Salt Lake, El Paso or Los Angeles.

Agents for Braun Laboratory Appliances.

BRAUN GAS BURNER



No. 4132A

FOR USE WITH ORDINARY ILLUMINATING OR FUEL GAS

Type 2675

There are many places where it is desirable to use illuminating or fuel gas in preference to liquid fuel, and to supply this demand the Braun Gas Burner has been designed, which permits the use of gas for assaying and melting purposes in an entirely satisfactory manner.

The construction of the burner is such that air and gas are properly mixed in right proportions after the recognized principles of Bunsen.

To obtain a sufficient amount of air for this burner it is necessary to employ a blower, which may be operated by electricity or any other available power.

We furnish blowers which will supply sufficient air for from one to three burners, that can be operated with belt power or can be attached to a small electric motor. These require about ⅙ horse power to operate.

The simplicity of this outfit will be appreciated when it is considered that a mere striking of a match and opening of valves controlling gas and air places the outfit in instantaneous operation.

Although this burner is described in connection with Combination Furnace No. 40, it can be arranged to operate any of our furnaces. Best results are obtained from ¾-inch gas supply pipe.

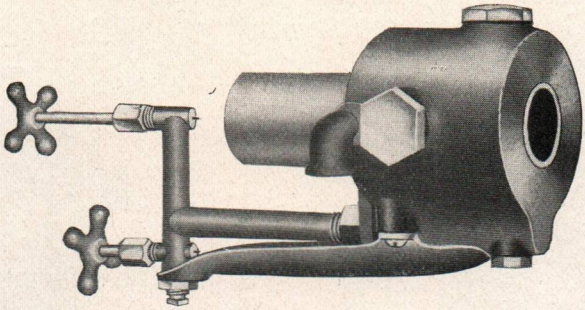
Weights (burner only): Net weight, 12 lbs. Shipping weight, 18 lbs.

Price (including air and gas valves) $20.00

Prices net F. O. B. Denver, Salt Lake, El Paso or Los Angeles.

Agents for Braun Laboratory Appliances.

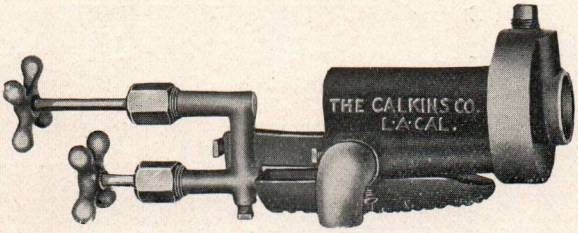
BURNERS, GASOLINE



No. 4133A

4133A **CHALLENGE HYDROCARBON BURNER.** This burner is practically indestructible, the main part of the burner consisting of one single copper casting. A straining and generating chamber filled with small gravel extends entirely around and along the combustion tube for half its length. The gasoline is admitted to this chamber at a point near the under side of the burner and farthest from the face of the burner. There is an annular duct at the face of the burner connected with the gravel chamber at the upper side of the burner and having an outlet at its lowest point into the duct which leads to the jets of the burner. This burner is provided with a sub-jet and a generating trough leading along under the burner from the sub-jet to the face of the burner. When the burner is once heated properly to the generating point, the sub-jet is to be closed. Type 2605.

Price $15.00



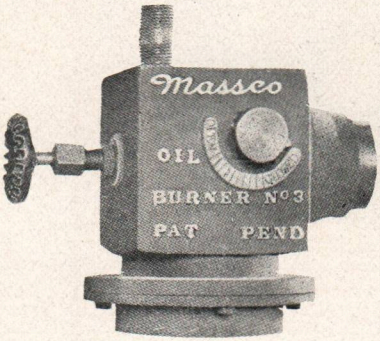
No. 4133B

4133B **"ADVANCE" HYDROCARBON BURNERS.** The acme of efficiency and simplicity; one solid casting; no parts to work loose and twist out of alignment; equipped with an auxiliary generating device; is beyond question or doubt the best assayers' burner on the market.

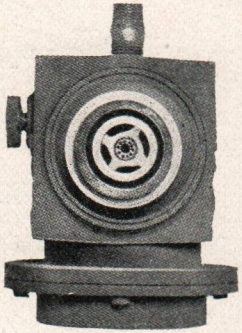
The "Advance" Hydrocarbon Burner was designed with a view to giving the purchaser a strong and efficient assay furnace burner of simple construction and at a low cost. It is without a peer for assayers' use, and has replaced many higher priced flimsily-constructed burners. Type 2601.

Price $6.50

BURNERS, *Massco*



No. 4134A
THE *Massco* BURNER
Type L, Angle Form
(Side View, showing the Air Regulating Adjustment.)



No. 4134B
THE *Massco* BURNER
Type L, Angle Form
(Front View)

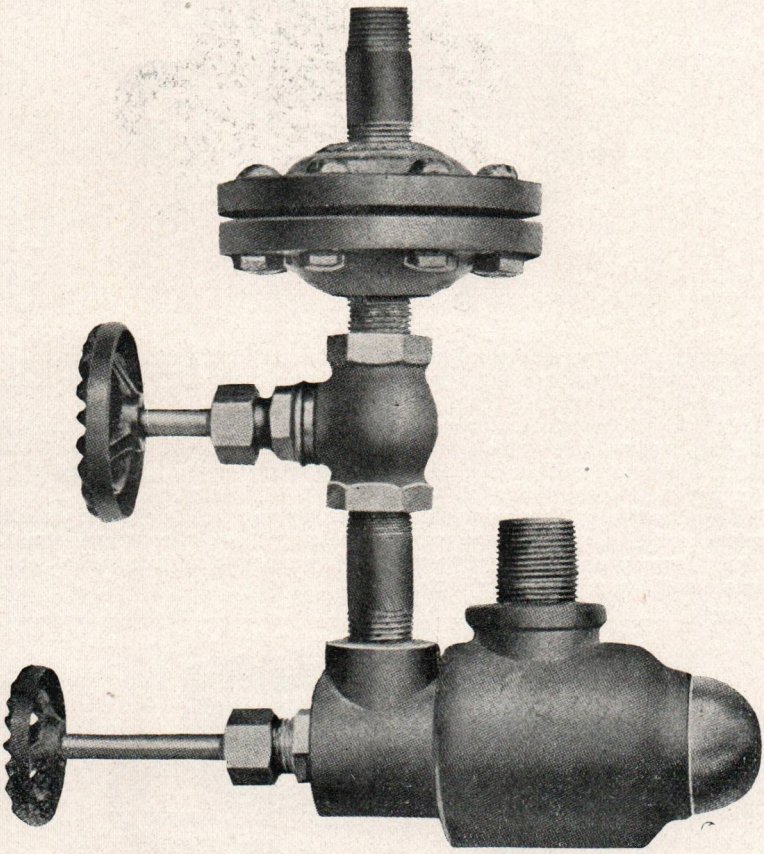
Prices, Capacities, Weights, Etc.

THE *Massco* LOW PRESSURE BURNERS

	Burner No.	Minimum Oil Used per Hr. Gals.	Maximum Oil Used per Hr. Gals.	H. P. Motor	Calculated H. P. for Series of Burners	Price of Burner	Price of Motor and Blower	Shipping Weight of Burners	Shipping Weight of Motor Fan
4134A	L-1	½	1½	¼	.22	$25.00	$100.00	12	150
4134B	L-2	½	2	¾	.51	25.00	125.00	12	230
4134C	L-3	1½	5	1½	1.2	30.00	150.00	16	270
4134D	L-4	2¾	12	3	1.8	35.00	200.00	25	325
4134E	L-5	4	25	5	3.75	50.00	300.00	40	450

Do not forget when order "L" type burner equipment to give the voltage, phase and cycle of current.

BURNERS, *Massco*



No. 4135A

THE *Massco* HIGH PRESSURE BURNER

Type H. With Oil Strainer

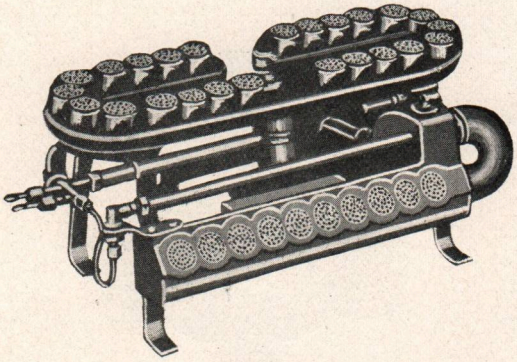
4135A No. 2-H. To operate, compressed air or steam under pressure.

Air or steam pressure, 25 to 100 pounds. Shipping weight, 10 pounds.

Price $18.50

BURNERS

Massec OXO-GAS



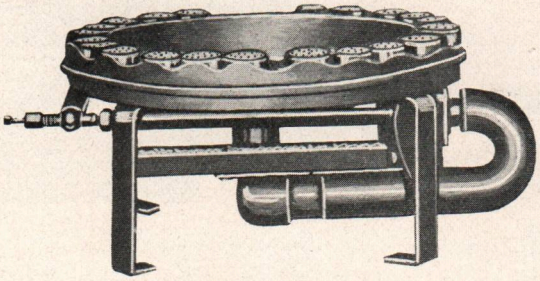
No. 4136A

Among the various methods that can be devised for rendering the use of fuels more economical, there are none more promising than OXO-GAS, as it increases the heat of the original fuel (coal oil) over 75%.

4136A An OXO-GAS Heater outfit No. 1 for cooking consists of the OXO-GAS Heater, the supply tank (which is made in three sizes, six, eight and ten-gallon capacity), the pump, which is used to put pressure on the tank, and the hollow wire for conducting the liquid oil to the OXO-GAS Heater.

The application of this principle for cooking and heating purposes offers the convenience of city gas with increased efficiency, lowest cost and simplicity of operation. Anyone anywhere, without previous mechanical knowledge, can install a complete outfit in a few hours' time.

Price, each $45.00



No. 4136B

HEATER RING

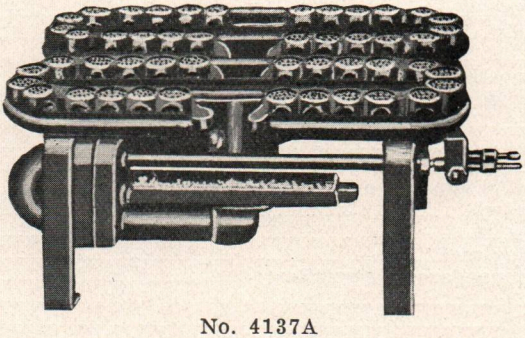
11 Inches in Diameter

4136B The OXO-GAS Ring No. 2 is intended for installation more particularly in base burners and heating stoves. When used in base burners it is installed underneath the grate and broken fire brick or tile is placed upon the grate, which assists in distributing and retaining the heat. It can also be installed in small hot water heaters for domestic use and more particularly laundry stoves, etc. The OXO-GAS Heater Ring No. 2 is designed to heat one large room or two small rooms only.

Price, each $37.50

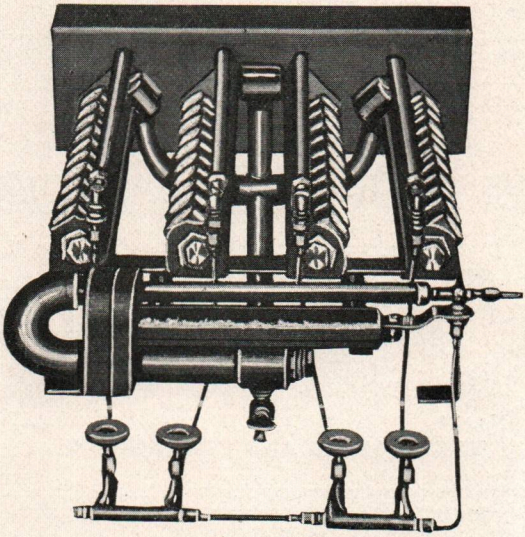
BURNERS

Massco OXO-GAS



No. 4137A

4137A **OXO-GAS HEATER NO. 3.** Installed in small furnaces for heat ing houses and bungalows up to six rooms or for use in large base burners. Dimensions: Length 15 inches, width 10 inches, height 5 inches. All Oxo-Gas heaters are furnished with heat refracting indistructible gas discs which intensifies the heat 25 to 30 per cent. Price each.....$62.50



No. 4137B

4137B **OXO-GAS HEATER NO. 4.** For hot air, hot water or steam furnaces. Illustrating details of sub flame attachment and subs for continuous heating of the generators, thus keeping the heat units ready for instant use. The regulating valves can be operated at the furnace or installed on an upper floor where most convenient. Dimensions: Length 18 inches, width 13 inches, height 8 inches. Price each $97.50

BURNERS

Massco OXO-GAS

4138A **PRICE LIST** of Supplies and Repairs for OXO-GAS Heating Appliances

Generator complete		$1.00
Generator tube only		.50
Generator gas tip		.40
Generator oil connection		.40
Generator asbestos filler		.25
Generator screen		.15
Lava discs, large	each	.15
Lava discs, small	each	.10
Steel wire screens for top and oven Burners		.10
Double Burner valve		1.00
Steel Valve stems		.25
Brass Valve packing nut		.10
Valve wire and connections to oven Heater		.40
Valve Key		.40
Tip cleaning needle		.25
Alcohol can		.40
Generator vise, complete as illustrated		2.00

TANK AND PUMP SUPPLIES

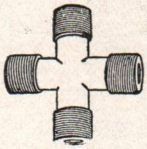
Gauge for tank		$3.00
"Never Leak" filler plug for tank		1.50
Oil valve and tube for tank		1.50
Air valve for tank		1.30
Washers for "Never Leak" filler plug	per dozen	.30
Pump washers	per pair	.30
Pump connection No. 10		.20
Pump check valve		.50
Pump hose	per foot	.30
Pump hose complete with connections		1.60

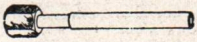
No. 1

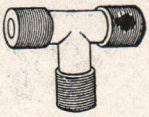
No. 13

No. 2

No. 8


No. 24

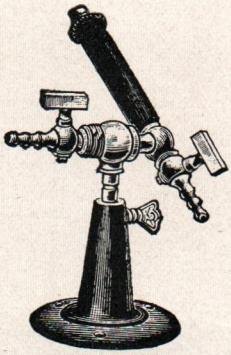

No. 10


No. 17

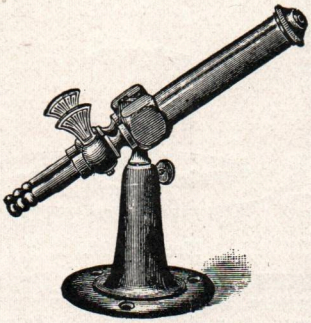
WIRE TUBING AND CONNECTIONS

Wire tubing	per foot	$0.06
Wire tubing, per pound, 1 pound averages 50 feet		3.00
Charge for brazing connections to wire tubing	per brazing	.10
Silver solder	per ounce	1.50
Male connection (this is not a plug)	See cut No. 1	.06
No. 1 Plug (blank end to stop wire)		.06
Nut and Jamb	See cut No. 13	.06
Complete union No. 1 and No. 13	See cut No. 2	.10
Double male connection, threaded for 2 No. 13 connections	See cut No. 8	.12
Tee threaded for 3 No. 13 connections	See cut No. 17	.20
Cross connection, threaded for 4 No. 13 connections	See cut No. 24	.24
Wall valve		1.30
Telescope couplings for wire	per dozen	.10

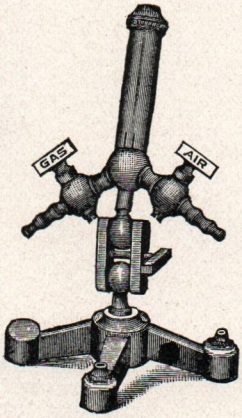
BLAST LAMPS



No. 4139A



No. 4139B

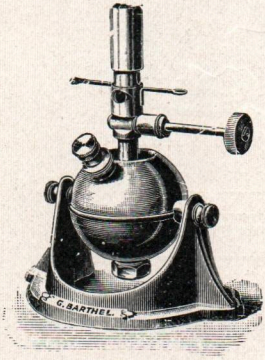


No. 4139C

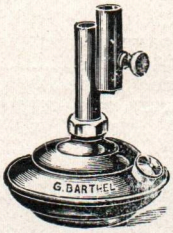
4139A **BLAST LAMPS, BUNSEN.** For gas. Type 1979 ..... $6.00

4139B **BLAST LAMPS, BUNSEN.** For gas; new pattern, blast and gas supply pipe in one direction. Type 1980 ..... 6.00

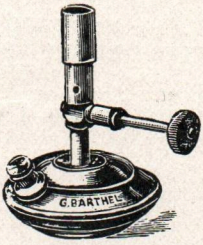
4139C **BLAST LAMPS, WISNEGG OR FRENCH FORM.** Mounted on ball joint. Type 1985 ..... 6.00



No. 4139D



No. 4139E



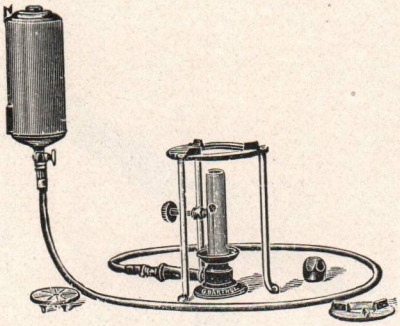
No. 4139F

4139D **BLAST LAMPS, BARTHEL'S.** For gasoline, on stand, revolves so as to give both vertical and horizontal flame, without danger of explosion. Price on application.

4139E **BURNERS, BARTHEL'S, BENZINE.** Working without wick; equal to 2 Bunsen gas burners. Price on application.

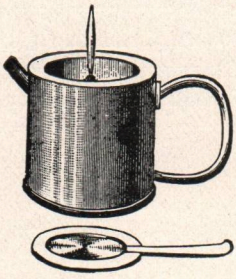
4139F **BURNERS, BARTHEL'S, BENZINE.** Boiler, with tube for Bunsen flame. Price on application.

BLAST LAMPS, ETC.



No. 4140A

4140A **BURNERS, BARTHEL'S, ALCOHOL.** Bunsen's style, equal to 4 Bunsen gas burners, complete with reservoir and 5-foot flexible metallic tubing. Tripod for same. Prices on application.



No. 4140B

No. 4040D

4140B **BLAST LAMPS.** Of heavy copper, for alcohol, upright blast, small size. Type 1990 ..... each $3.25

4140C Same as above, large size. Type 1995 ..... each 4.25

4140D **BLAST LAMPS.** Of brass and copper, with safety valve, for alcohol, horizontal blast. Type 2000 ..... each 4.25

No. 4140E

4140E **BUTTON TRAYS.** For silver buttons; plates 5½x2¼ inches, with 24 depressions of ⅜ inch diameter, and ⅛ inch deep, milled smooth, neatly finished for use inside of balance case ..... each $1.50

4140F **BUTTON TRAYS.** Fibre, an improvement over the iron tray, 12 holes 1.50

24 holes 2.00

ATTACHMENTS FOR BUNSEN BURNERS

No. 4141A

No. 4141B

No. 4141D

No. 4141F

No. 4141H

No. 4141K

No. 4141M

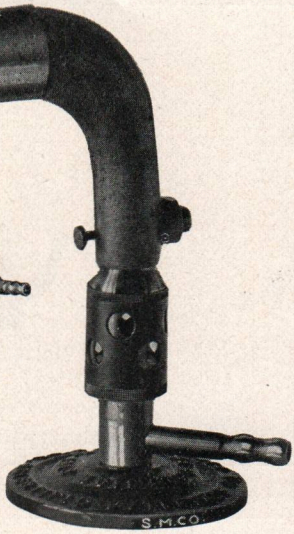
No. 4141O

4141A	**BURNER TUBE,** for blowpiping, with yellow flame, fitting inside the burner. Type 2140	$0.25
4141B	**BURNER TIP,** with rest for blowpipe, for $\frac{7}{16}$-inch Burner. Type 2145	.15
4141C	**BURNER TIP,** as above but for ½-inch burner. Type 2146	.15
4141D	**BURNER CROWN,** giving a round flame, for heating small dishes, for $\frac{7}{16}$-inch Burner. Type 2150	.45
4141E	**BURNER CROWN,** as above but for ½-inch Burner. Type 2151	.50
4141F	**BURNER GAUZE TOP,** giving a large round flame, for $\frac{7}{16}$-inch Burner. Type 2155	.25
4141G	**BURNER GAUZE TOP,** as above but for ½-inch Burner. Type 2156	.50
4141H	**BURNER WING TOP,** for bending glass tubing, etc., for $\frac{7}{16}$-inch Burner. Type 2160	.15
4141I	**BURNER WING TOP,** as above but for ½-inch Burner. Type 2161	.20
4141J	**BURNER WING TOP,** plain copper, for $\frac{7}{16}$-inch Burner. Type 2162	.15
4141K	**BURNER STAR,** for $\frac{7}{16}$-inch Burner. Type 2165	.25
4141L	**BURNER STAR,** for ½-inch Burner. Type 2166	.25
4141M	**BURNER TRIPOD,** for $\frac{7}{16}$-inch Burner. Type 2170	.15
4141N	**BURNER TRIPOD, LARGE,** for ½-inch Burner. Type 2171	.20
4141O	**CHIMNEY,** of sheet iron, 2 inches diameter at bottom. Type 2174	.15
4141P	**CHIMNEY,** of sheet iron, large, 2½ inches diameter at bottom. Type 2176	.15
4141Q	**CHIMNEY,** of sheet iron, with support for $\frac{7}{16}$-inch Burner. Type 2178	.75
4141R	**CHIMNEY,** as above but for ½-inch Burner. Type 2179	.75
4141S	**SPIDER,** to fit ⅜-inch Burner No. 2185. Type 2183	.25
4141T	**CROW'S NEST,** to fit ⅜-inch Burner No. 2185. Type 2184	.50

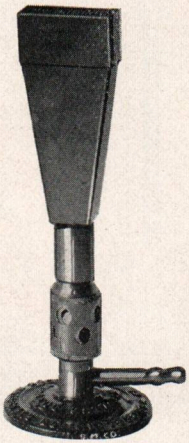
BURNERS

No. 4142B

No. 4142D



No. 4142C



No. 4142E

MEKER BURNERS

4142A **BURNER, MEKER, STANDARD.** Type 1 for sealing, Type 2 used instead of the Bunsen, Type 3 for general laboratory practice, Type 4 to replace the blast burner, Type 5 for special purposes and with furnaces.

Type	1	2	3	4	5
Height of burner	115	130	155	190	250 mm.
Diameter of flame	16	20	24	30	43 mm.
A. For Artificial Gas	$2.10	2.30	3.35	3.70	7.90
B. For Natural Gas	$2.65	2.85	4.00	4.30	8.65
C. For Gasoline Gas	$2.65	2.85	4.00	4.30	8.65

(In ordering state whether artificial, (water or coal gas) nautral or gasoline gas will be used. If this is not specified we will send burners for artificial gas.)

4142B **BURNER, MEKER, SM TYPE.** For students. Of cheaper construction, with brass gaid instead of nickel gaid in the Standard burner. Made in large quantities especially for the school and college laboratories. Size 115 mm. height, 16 mm., diameter of flame. Type 0 ..... $1.75

4142C **BURNER, MEKER, PIPE SHAPE, HORIZONTAL.** Height of burner 100 mm., diameter of flame 30 mm. Type 6.

	For Artificial Gas	For Natural Gas	For Gasoline Gas
Each	$5.45	6.00	6.00

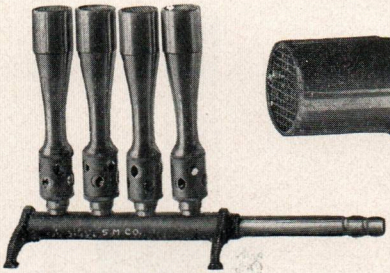
4142D **BURNER, MEKER, PIPE SHAPE, VERTICAL.** Height of burner 100 mm., diameter of flame 30 mm. Type 7.

	For Artificial Gas	For Natural Gas	For Gasoline Gas
Each	$5.45	6.00	6.00

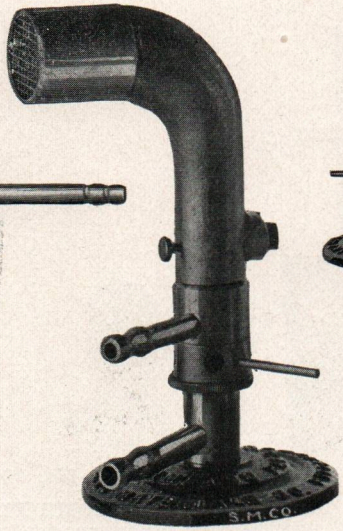
4142E **BURNER, MEKER, FLAT FLAME.** Height of burner 225 mm., flame 15x50 mm. Type 8.

	For Artificial Gas	For Natural Gas	For Gasoline Gas
Each	$6.65	7.25	7.25

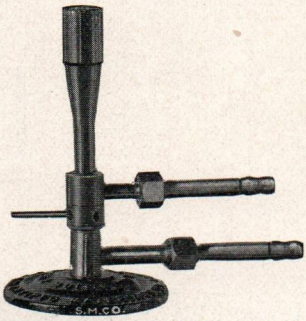
BURNERS



No. 4143A



No. 4143C



No. 4143D

4143A **BURNER, MEKER, MULTIPLE TUBE.** Row of four burners.
Type 9.
A For Artificial Gas.....$21.00
B For Natural Gas..... 23.00

4143B **BURNER, MEKER, MULTIPLE TUBE.** Row of six burners.
Type 10.
A For Artificial Gas..... 23.00
B For Natural Gas..... 27.00

These burners can also be supplied containing any number of different size tubes desired.

MEKER BLAST BURNERS

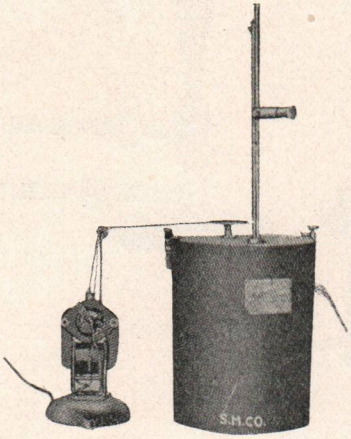
Since the application of ordinary Meker Burners using the pressure of gas alone enables one to obtain temperatures equal to those usually obtained with a blow-pipe flame, it follows that the use of an air-blast judiciously combined with this system will enable far higher temperatures to be obtained.

Blast Burners are supplied in similar shapes and sizes to the Standard Meker Burners, and are made in two patterns.

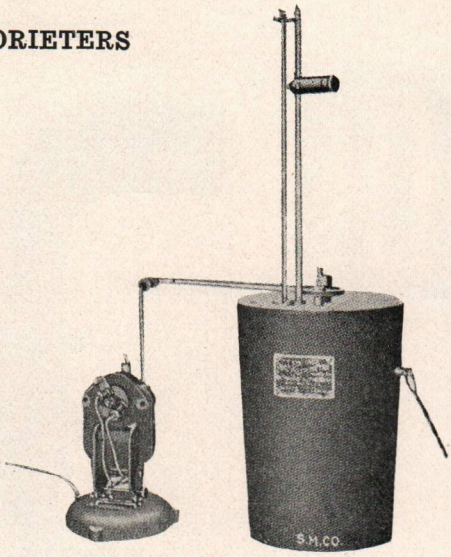
A With short inlet tubes for general use but not with furnaces.
B With long inlet tubes and cap entirely of nickel, for use with furnaces.

4143C	Meker Blast Burner	Correspond-ing to	A Short Inlet	B Long Inlet	Height of Burner	Diameter of Flame
	Type 18	Type 2	$ 5.50	$ 7.00	135 mm.	20 mm.
	Type 19	Type 4	700	9.00	190 mm.	30 mm.
	Type 20	Type 5	12.00	13.50	250 mm.	43 mm.
	Type 21	Type 6	$ 7.75		160 mm.	30 mm.
	Type 22	Type 6 larger	14.50		250 mm.	43 mm.
	Type 23	Type 7	7.75		100 mm.	30 mm.
	Type 24	Type 7 larger	14.50		140 mm.	43 mm.
	Type 25	Type 8	9.75		225 mm.	15x30 mm.

CALORIETERS



No. 4144A



No. 4144D

4144A **CALORIMETERS, PARR'S, OXYGEN BOMB TYPE.** The bomb is made of an acid-resisting alloy superior in strength to the best tool steel and has a resistivity to the acids formed in combustion entirely comparable to platinum. The insulating container is a double walled vessel of indurated fibre. Complete with bomb, insulating vessel with cover, stirrer and pulley, oxygen connection with gauge, needle valve and couplings, 6 capsules of special alloy, reading lens and support, ring support for holding calorimeter covers with thermometer, special ignition wire and gaskets, without thermometer and motor. (State voltage when ordering).....$300.00

4144B **THERMOMETER** for above, graduated in 1/20 deg. F., with U. S. Bureau of Standards certificate..... 12.00

4144C **ELECTRIC MOTOR** for above, with variable speed..... 28.00

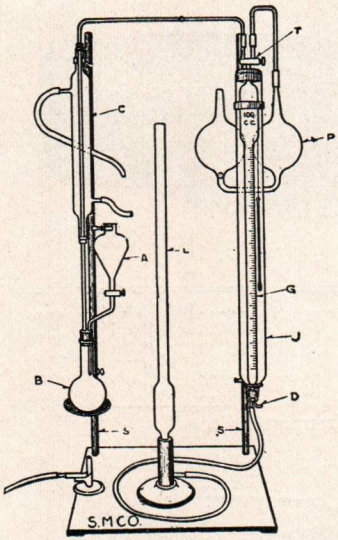
4144D **CALORIMETER, PARR'S, NEW FORM.** This calorimeter does not use oxygen gas as is customary in the usual type of bomb calorimeter, sodium peroxide being used as the combustion medium. The special advantages are that the cup or crucible in which fusion takes place is removable, one ertra being furnished for duplicate determinations. The outfit consists of the apparatus as illustrated (without motor and support) including thermometer graduated to 1/20 deg F., and certified by U. S. Bureau of Standards, a two-liter measuring flask, chemical receptacle, measuring cup, 5-inch 100-mesh brass frame sieve, with bottom, chemicals sufficient for 50 determinations, special chemical for petroleum, etc., pincers, ignition wire, reading lens and camel's hair brush. Complete outfit with electrical ignition including battery without motor. (State voltage when ordering.).....$100.00

4144E **ELECTRIC MOTOR** for above, with variable speed..... 28.00

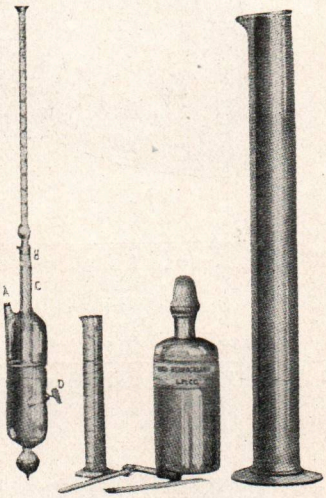
4144F **EXTRA THERMOMETER** for above with Bureau of Standards Certificate..... 12.00

ACCESSORIES. Prices on application.

CARBON APPARATUS



No. 4145A



No. 4145B

4145A **CARBON APPARATUS, PARR,** for the determination of total carbon in coal, coke, in connection with the Parr Calorimeter. This outfit obviates the necessity of the usual combustion method of ultimate analysis in determining the carbon content of fuels. The residue, from the determination of the heat values by using sodium peroxide, is utilized. By adding acid to the dissolved material in this apparatus that carbon dioxide gas is evolved under conditions which make it available for volumetric measurement. Complete with directions and tables. $52.00

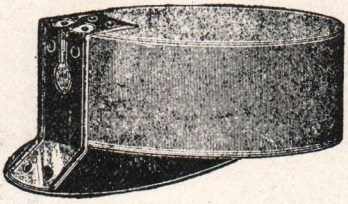
4145B **CARBONATE APPARATUS,** designed by J. F. Barker, M. S., Ohio State University. For the determination of carbonates in limestone, fertilizers, soda baking powders, and other materials. Descriptive literature on request. Complete as illustrated including hydrometer, jar, graduated cylinder, dropping pipette and one pound hydrochloric acid $17.00

4145C **HYDROMETER** only 13.00

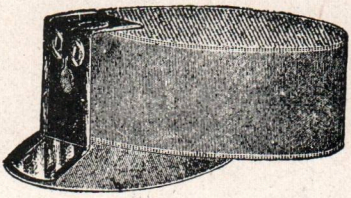
CARBONIC ACID APPARATUS. See also Alkalimeters.

CARBONIC ACID FLASKS. See Flasks.

MINERS' CAPS



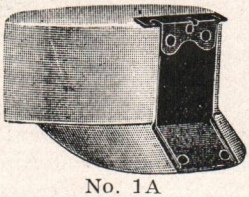
No. 103



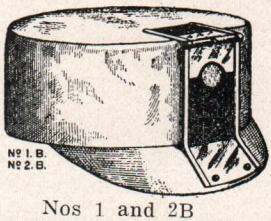
No. 106

No. 101,	10-ounce	White	Duck,	assorted	sizes	.....	per dozen	....
" 102,	10 "	Brown	"	"	"	.....	"	....
" 103,	8 "	White	"	"	"	.....	"	....
" 104,	8 "	Brown	"	"	"	.....	"	....
" 106,	12 "	White	"	"	"	.....	"	....

Nos. 101, 102, and 106 have patent butterfly and stirrup attachment.



No. 1A



Nos 1 and 2B

No. 1A,	12-ounce	White	Duck,	assorted	sizes	.....	per dozen	....
" 10A,	10 "	"	"	"	"	.....	"	....
" 2A,	12 "	Brown	"	"	"	.....	"	....
" 1B,	10 "	White	"	"	"	.....	"	....
" 12B,	12 "	"	"	"	"	.....	"	....
" 2B,	10 "	Brown	"	"	"	.....	"	....

Nos. 1 and 2A have Lattimore attachment.

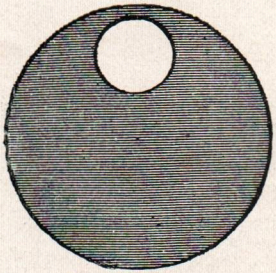
Nos. 50 and 51

No. 50,	8-ounce	Brown	Duck,	assorted	sizes	.....	per dozen	....
" 51,	8 "	White	"	"	"	.....	"	....

These are the old style leather attachment.

CARBIDE, CHECKS, ETC.—MINERS'

MINERS' CHECKS



Made in three sizes; 1⅜, 1½ and 1¾ inches in diameter with ⅜-inch hole.

No. 4147A

Price.....per pound ....

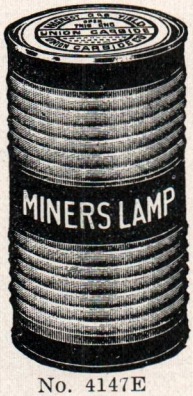
BALL LAMP WICK

This wick is put up in 5-pound bales, and runs from 8 to 9 balls to a pound.

No 4147C

Price, Best Grade.....per pound ....
" Medium Grade... " ....

UNION CARBIDE
100-POUND DRUMS



No. 4147E

For use in miners' lamps. Packed in drums of 100 pounds.

Price .....per pound ....

UNION CARBIDE
2-POUND CANS

No. 4147B

Packed in blue and gray cans consisting of ½-inch lump, 24 cans in a case.

Price, per pound ....

10-POUND CANS

No. 4147D

Packed in gray cans with blue bands consisting of 1-inch lump, 6 cans in a case.

Price, per pound ....

25-POUND DRUMS

No. 4147F

Packed in blue and gray drums for use in miner's lamps.

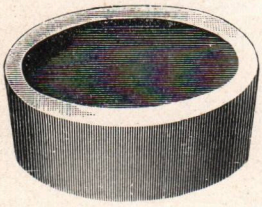
Price, per pound ....

100-POUND DRUMS

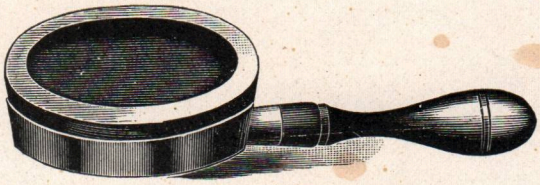
Put up for special use in miners' lamps and packed in gray drums with blue bands.

Weight.....pounds 100
Price.....per pound ....

CARBON SOLDERING BLOCKS



No. 4148A



No. 4148B

4148A **CARBON SOLDERING BLOCKS.** For supporting work under the blow pipe. Cleanly and perfect non-conductors. They are circular, depressed on each face, and 4 inches in diameted.....$0.50

4148B **CARBON SOLDERING BLOCK HOLDERS.** A very convenient device for holding carbon soldering blocks..... .50

CARBOY ROCKER OR INCLINATOR. See page 1.

CASSEROLES

No. 4148C

4148C **CASSEROLES, COORS,** glazed with exception of rim, with lip and flat porcelain handle. Type 521.

Size number	1	2	3	3a	4	4a	5	6	7
Outside dia., mm	50	70	85	95	110	135	135	165	175
Inside dia., mm	47	66	80	90	105	130	130	160	170
Height, mm	25	35	45	50	62	90	80	95	130
Capacity, cc	30	75	150	210	375	500	750	1250	2000
Each	$ .35	.40	50.	.70	.90	1.15	1.40	2.00	3.50

4148D **CASSEROLE, COORS,** glazed, with exception of rim, with lip and extra long handle. Type 522.
Size number 4; diameter, 117 mm.; height, 56 mm.; capacity, 360 cc. Each.....$1.10

No. 4148E

No. 4148F

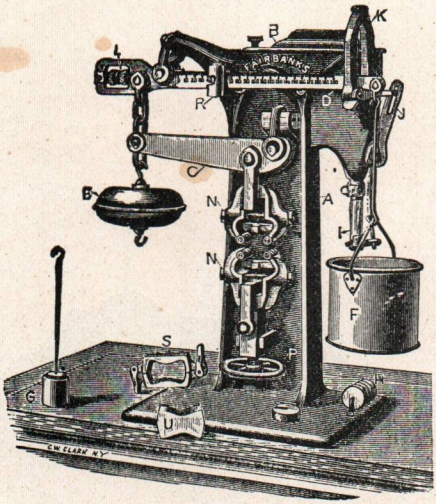
4148E **CASSEROLES, PORCELAIN.** With cover and wooden handle.

Diameter .....in.	3½	4	4½	5	6	6½
Capacity .....in.	4	8	12	16	24	32
Each	$0.90	1.00	1.50	1.80	2.65	3.30

4148F **CASSEROLES, AGATEWARE.**

Diameter .....inch	4½	6	7
Capacity	1 pt.	1 qt.	½ gal.
Each	$0.40	.50	.60

CEMENT TESTING APPARATUS



No. 4149A

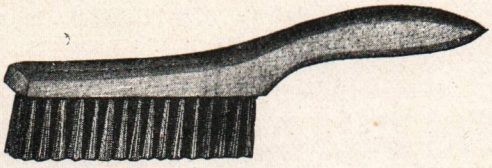
4149A **CEMENT TESTING MACHINE,** Automatic, Fairbanks. This machine is recognized as the standard. Capacity, 1,000 pounds; size 24x24 inches. Outfit includes one standard Briquette Mould.

Price on application.

4149B **TESTING MACHINE,** Fairbank's Automatic Improved, with tension attachment.

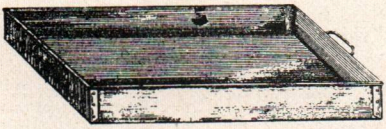
This machine is the same as the above but is equipped with auxiliary base containing worm and worm gear, connected to an axis which is threaded and passes up through the base and hand-wheel with a block, and the latter connected to the lower clamp.

Price on application.



No. 4149C

4149C **CEMENT-BRIQUETTE MOULD BRUSHES,** with Brass Wire Brush and Wooden Handle. Brush portion, 5 inches long.
Price on application.



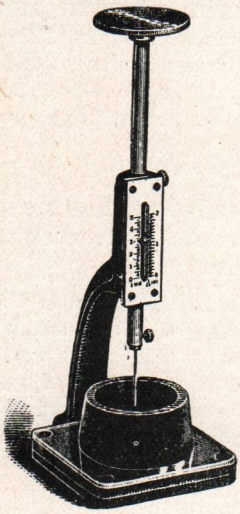
No. 4149D

No. 4149E

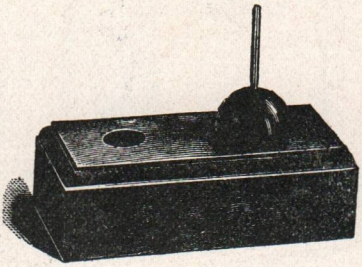
4149D **CEMENT-GALVANIZED IRON PANS,** with Handles. Size, 24x24x3 inches.
Price on application.

4149E **CEMENT-GLASS PLATES,** of Heavy Glass with Smooth Edges, size 24x24 inches.
Price on application.

CEMENT TESTING APPARATUS



No. 4150A

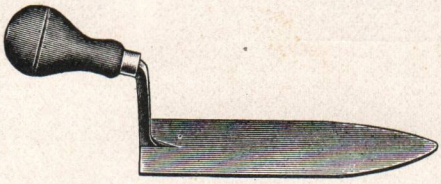


No. 4150B

4150A **CEMENT-VICATS INDENTING APPARATUS,** improved. This apparatus does not require (as do other makes), an extra compensating weight to give a downward pressure of 300 grams when the 1 millimeter needle is used (as both needles are made to weigh the same), thus obviating an element of error by overlooking the use of the compensating weight with the small needle.
Extra Hard Rubber Ring Moulds.
Extra Needles, 1 millimeter or 1 centimeter.
Prices on application.

4150B **CEMENT-GILMORE NEEDLE.** These needles are used for determining both the initial and the final set of cement.

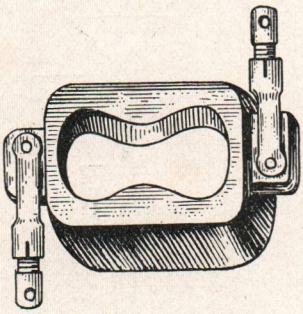
They consist of a steel needle 1/12 of an inch in diameter, loaded with a weight of ¼ pound, and of a needle 1/24 of an inch in diameter, loaded with a weight of one pound.
Price on application.



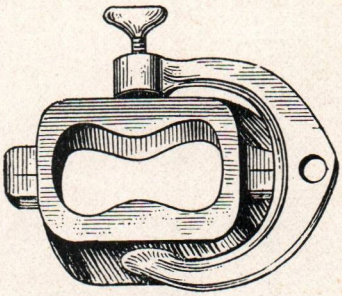
No. 4150C

4150C **CEMENT TROWEL.** Large and small.
Prices on above on application.

CEMENT TESTING APPARATUS



No. 4151A

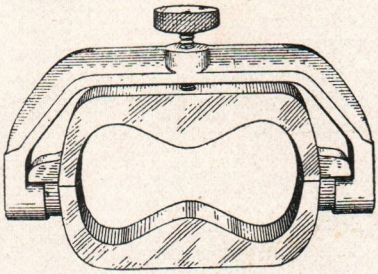


No. 4151B

4151A **STANDARD CEMENT-BRIQUETTE MOULD,** with end clamp according to the specifications of the American Society for testing materials.

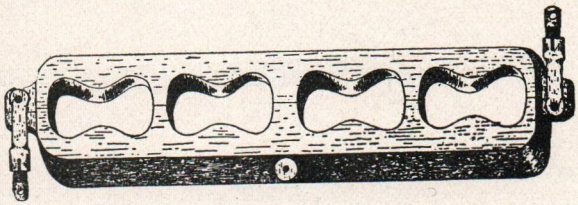
4151B **STANDARD CEMENT MOULD,** as above, but with C Clamp.

4151C **EXTRA C CLAMPS** for same.
Prices on application.



No. 4151D

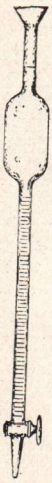
4151D **IMPROVED STANDARD CEMENT-BRIQUETTE MOULD,** with means for separating sections automatically without rapping, according to the specifications of the American Society for testing materials.
Price on application.



No. 4151E

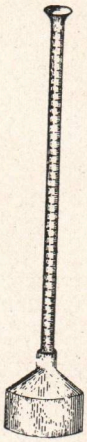
4151E **STANDARD CEMENT-BRIQUETTE MOULDS.** Gangs of 2, 3, 4, 5, 6.
Prices on application.

CEMENT TESTING APPARATUS

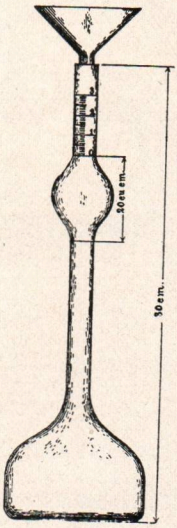


No. 4152A

No. 4152B



No. 4152C



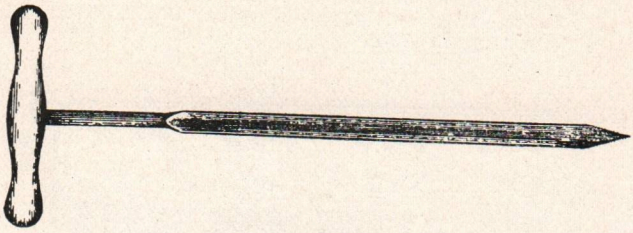
No. 4152D

4152A **SPECIFIC GRAVITY APPARATUS**—Jackson's. Consisting of the Burette, so graduated as to give direct readings in specific gravity, and the heavy Erlenmeyer Flask with hollow glass stopper. Price on application.

4152B **EXTRA FLASKS.** Price on application.

4152C **VOLUMENOMETER**—Shumann's, with tube graduated to 50 c.c. in 1-10 c.c. Price on application.

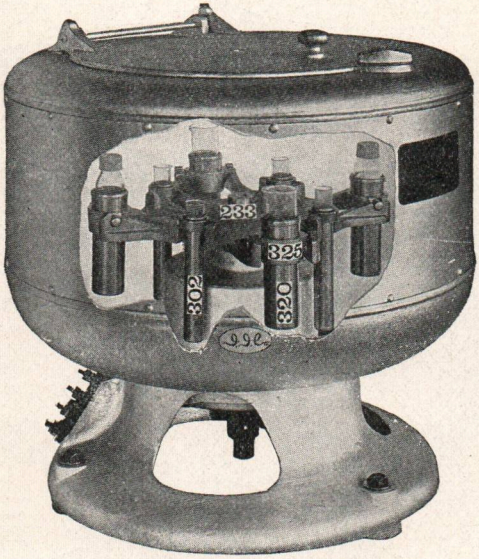
4152D **SPECIFIC GRAVITY APPARATUS**—La Chatelier's, for cement. Price on application.



No. 4152E

4152E **CEMENT SAMPLER,** for obtaining samples from the center of a barrel, the point being an auger, enabling one to bore through the staves. Price on application.

CENTRIFUGES



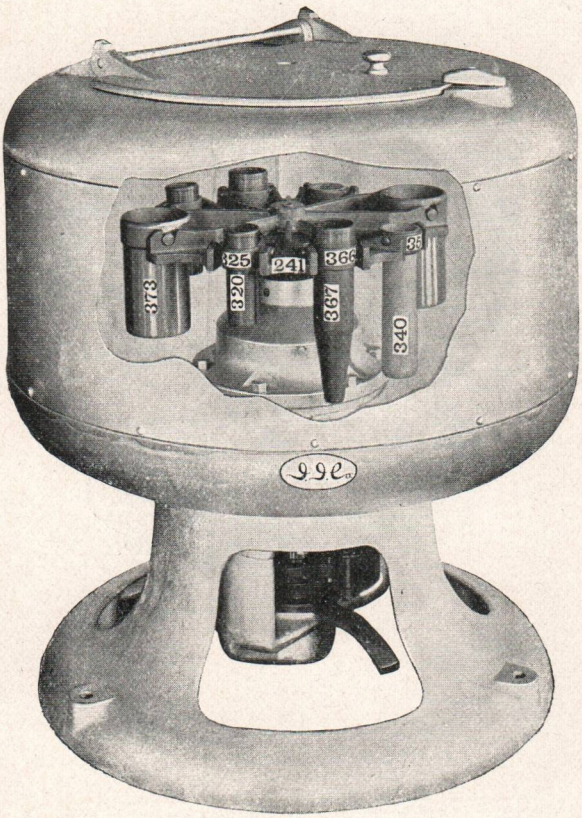
No. 4153A

SIZE 1, INTERNATIONAL CENTRIFUGE

4153A Height, closed, 23″; open, 33″. Diameter, 17″. Shipping weight, about 275 pounds complete with electric motor and speed controller, variety of heads and tubes as required for different purposes and supplied as ordered. Cut shows machine with combination head No. 233, with four places for 15 c.c. tubes and four places for 50 c.c. tubes or for Babcock Milk Test Cups.

Price $127.40

CENTRIFUGES



No. 4154A

SIZE 2, INTERNATIONAL CENTRIFUGE

4154A Height, closed, 28″; open, 40″. Diameter, 24″. Shipping weight, about 450 pounds, complete with electric motor and speed controller, variety of heads and cups as required for different purposes and supplied as ordered. Cut shows machine with combination head No. 241, having two places for cups of 250 c.c. capacity and six places for tubes of 15 c.c., 50 c.c. or 100 c.c. capacity.

Price $201.50

CENTRIFUGES

PRICES, INTERNATIONAL CENTRIFUGES

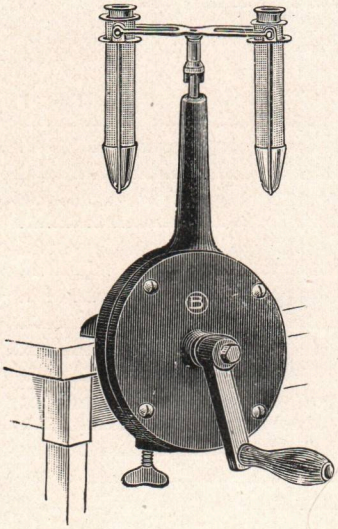
No. 4155A

Size 1 Electric Centrifuge with Speed Controller, but without heads or tubes; current must be specified when ordering	$127.40
8 Tube 15 c.c. Head only, and attached trunnion rings, No. 225	15.60
8 Tube 50 c.c. Head only, No. 240	15.60
8 Tube Combination Head only, with four attached 15 c.c. trunnion rings, and four 50 c.c. places, No. 233	16.90
5″ diameter perforated bronze basket and copper draining chamber, No. 280	28.60
15 c.c. Cornell metal tube and rubber cushion, No. 302, each	.72
50 c.c. trunnion ring, No. 325, each	.52
50 c.c. Cornell metal tube and rubber cushion, No. 320, each	.84
Babcock-test trunnion cups with rubber pad, No. 362, each	.78
Size 2 Electric Centrifuge with Speed Controller but without heads or tubes; current must be specified when ordering	201.50
8 Tube 50 c.c. Head, No. 240, without rings or tubes	15.60
15 c.c. Trunnion Ring, No. 310, each	.59
15 c.c. Cornell metal tube and rubber cushion, No. 302, each	.72
50 c.c. Trunnion Ring, No. 325, each	.52
50 c.c. Cornell metal tube and rubber cushion, No. 320, each	.85
100 c.c. Trunnion Ring, No. 350, each	.52
100 c.c. Cornell metal tube and rubber cushion, No. 340, each	.98
100 c.c. Oil Tube trunnion ring, No. 366, each	.52
100 c.c. metal tube, No. 367, with special cushion for 100 c.c. graduated oil tubes, each	1.63
Babcock-Test trunnion cup and rubber pad, No. 362, each	.78
8 place combination head, No. 241, with six places like No. 240 above, and two places for 250 c.c. trunnion cups, head only	19.50
250 c.c. trunnion cup with rubber cushion, No. 373, each	4.55
Carriers to take 150 c.c. Squibb Funnels, No. 392 (two can be carried in head No. 241), each	2.60
Long metal tube and trunnion ring for 9″ Babcock-test bottles, 365a and 366	1.95
11″ diameter perforated bronze basket and copper draining chamber, No. 285	45.50

GLASS TUBES

15 c.c. plain, taper bottom, per dozen	2.08
15 c.c. graduated, taper bottom, per ½ dozen	3.12
50 c.c. round bottom, plain, per dozen	2.34
50 c.c. blunt taper bottom, graduated, per ½ dozen	4.94
100 c.c. round bottom, plain, per dozen	2.47
100 c.c. long taper bottom, oil tubes, per ½ dozen	16.25
250 c.c. Sterilizer bottles, per dozen	2.92

CENTRIFUGES



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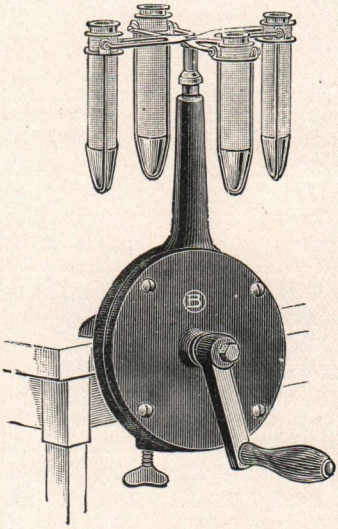


No. 4156B

NEW HAND CENTRIFUGES, made with accurately cut Phosphor Bronze Gears, assuring unusual durability; with Babbitt Metal bearing and ball bearing rest, smooth and quiet running. Entirely dust-proof. The Release Clutch on the handle, a very desirable feature, makes it impossible to stop suddenly and disturb the sediment in glass tubes. You can obtain 2000 to 2500 revolutions per minute.

TUBE HOLDERS

Quite a serious fault with Centrifuges heretofore is the danger of the tubes bursting, spoiling the test and at times injuring the operator. With our new style Holders this fault is entirely eliminated, an improvement which we feel will be appreciated by the profession.

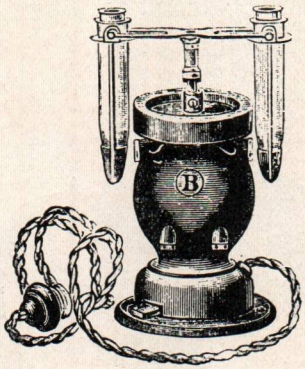
4156A **CENTRIFUGE,** single arm, one each plain and graduated 15 c.c. glass tubes. Type 1161. Each $12.00

4156B **CENTRIFUGE,** double arm, two plain and two graduated 15 c.c. glass tubes. Type 1161a. Each 15.00

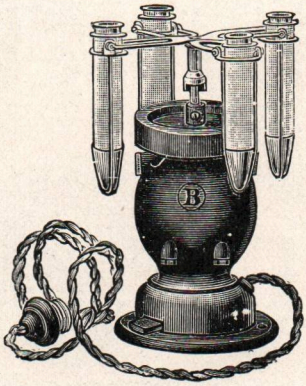
4156C **CENTRIFUGE,** single arm, one each plain and graduated 50 c.c. glass tubes. Type 1161b. Each 15.00

4156D **CENTRIFUGE,** double arm, two plain and two graduated 50 c.c. glass tubes. Type 1161c. Each 19.00

CENTRIFUGES



No. 4157A



No. 4157B

ELECTRIC CENTRIFUGES, for Blood, Sputum and Milk Analysis. For either direct or alternating current (110 Volt) with Rheostat to control speed of motor. This Apparatus embraces all the new features essential to scientific use, assuring quiet running and high speed efficiency. The Electric Centrifuges, as well as our Hand and Water Power Style, are all constructed with an absolute radius of 6¾ inches on the arm and tube, which is required for proper and efficient precipitation of urine.

These Motors can be used on **both direct and alternating current** if necessary, yet we do not advise or guarantee same on direct current 110 Volts for a longer period than three to five minutes. Where either direct or alternating currents are available it is advisable to order for the particular current on which the Motor is to be used.

Provided with new Arm with patented Safety Tube Holders, preventing the Aluminum and Glass Tubes from flying out. Complete with 6 feet Electric Cord and Plug.

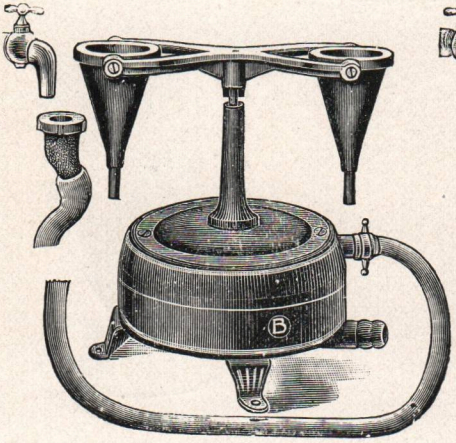
In connecting Centrifuge with Electric Current, never start with full current. Turn on gradually by means of the Rheostat.

4157A **CENTRIFUGE,** single arm, one each plain and graduated 15 c.c. glass tubes. Type 1163. Each.....$27.00

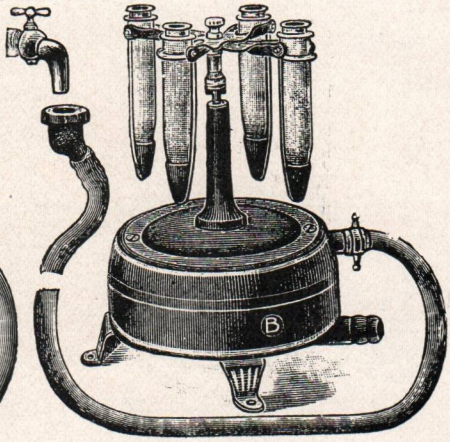
4157B **CENTRIFUGE,** double arm, two plain and two graduated 15 c.c. glass tubes. Type 1163a. Each..... 30.00

4157C **CENTRIFUGE,** single arm, one each plain and graduated 50 c.c. glass tubes. Type 1163b. Each..... 30.00

CENTRIFUGES



No. 4158E



No. 4158B

WATER MOTOR CENTRIFUGE for the rapid and convenient sedimentation of solids in urine and other fluids.

Perfect mechanical construction.

Absolutely noiseless.

Contact parts cannot become rusted.

Needs no attention.

May be left running constantly.

Any one can operate it. The simplest and most efficient Power Centrifuuge yet offered.

The demands of modern clinical work have rendered the use of a power Centrifuge absolutely imperative in hospitals and private laboratories where much urinalaysis is carried on. Our water motor centrifuge cannot get out of order on account of the exceeding simplicity of its construction.

The ball bearings are protected so that the water cannot wash the oil out of the same, nevertheless we would advise frequent oiling of the parts.

It may be attached to any ordinary faucet, the attachment being the work of a moment only. The speed is under absolute control by merely turning on or off the flow of water. The machine may safely be left without attention while running. It is provided with new Arm, with patented Safety Tube Holders preventing the Aluminum and Glass Tubes from flying out.

Aluminum shields, four feet pressure tubing and patent hose connection included with each apparatus.

4158A **CENTRIFUGE,** single arm, one each plain and graduated 15 c.c. glass tubes. Type 1165. Each $15.00

4158B **CENTRIFUGE,** double arm, two plain and two graduated 15 c.c. glass tubes. Type 1167. Each 20.00

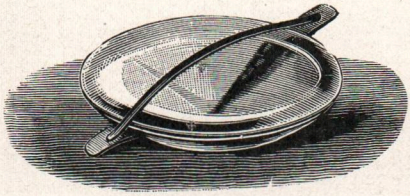
4158C **CENTRIFUGE,** single arm, one each plain and graduated 50 c.c. glass tubes. Type 1168. Each 20.00

4158D **CENTRIFUGE,** dougle arm, two plain and two graduated 50 c.c. glass tubes. Type 1169. Each 25.00

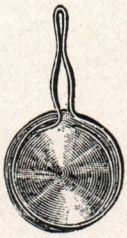
4158E **CENTRIFUGE,** water motor, with Goetz Arm, for the rapid approximate determination of Phosphorous in steel by the Goetz method. Type 1177. Each 15.00

CLAMPS

No. 4159C



No. 4159F



No. 4159G

4159A **CHAMOIS SKINS.** Best quality, entirely waterproof.

Size ..... inches	12x16	17x23	23x26
Each	$0.60	1.25	2.00

In ordering, state size.

4159B **CHARCOAL.** Of hard wood, cut in oblong pieces, 4½x1 inches for blow pipe use ..... per dozen $0.60

4159C **CLAMPS, CHADDOCK'S.** For test tubes, of japanned spring wire, rubber covered jaws ..... each .45

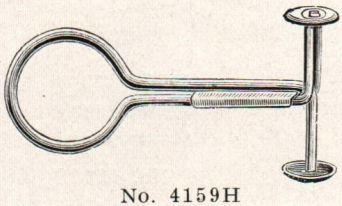
4159D **CLAMPS, CHADDOCK'S.** For beakers, of japanned spring wire, rubber covered jaws ..... each .45

4159E **CLAMPS, CHADDOCK'S.** For evaporating dishes, of japanned spring wire ..... each .45

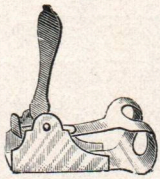
4159F **CLAMPS.** For watch glasses, sheet brass, nickel-plated.

Size	Small	Large
Each	$0.25	.30

4159G **CLAMPS.** For watch glasses, brass wire ..... each $0.35



No. 4159H



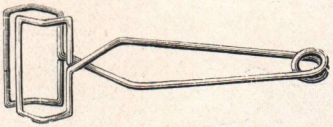
No. 4159I

4159H **CLAMPS, MOHR'S.** Spring compressor, nickel-plated. Type 1690.

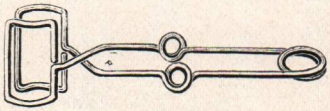
Size ..... inches	2½	3	3½
Each	$0.15	.25	.35

4159I **CLAMPS, OR CUT-OFFS.** Nickel-plated, large size, with $\frac{5}{16}$-inch opening. Type 1695 ..... each $0.15

CLAMPS



No. 4160A



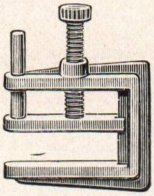
No. 4160B

4160A **CLAMPS, OR TEST TUBE HOLDERS.** (Stoddard's), of spring wire, nickel-plated, 4½ inches long. Type 1700 ..... $0.20

4160B **CLAMPS, OR TEST TUBE HOLDERS.** Of spring wire, with improved finger rests, 5 inches long. Type 1705 ..... .25

No. 4160C

4160C **CLAMPS, OR TEST TUBE HOLDERS.** Of wood, improved construction, with wire spring $0.25

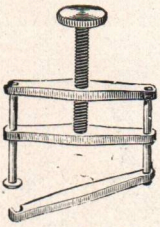


No. 4160E

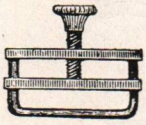
4160D **CLAMPS, OR FORCEPS.** For cover glass (Stewart's), nickel-plated, of spring wire, 4½ inches long $0.10

4160E **CLAMPS, OR SCREW COMPRESSORS.** Brass, nickel-plated, new construction, can be placed upon the tube without disconnecting the apparatus. Type 1662.

Size ..... inches	½ x ¾	¾ x 1¼
Each	$0.30	.60



No. 4160F



No. 4160G

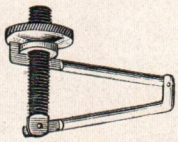
4160F **CLAMPS, HOFFMAN'S SCREW COMPRESSOR.** Improved form, can be used on tubing without disconnecting apparatus. Type 1670.

Size ..... inches	½ x ¾	½ x 1
Each	$0.45	.50

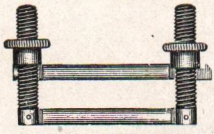
4160G **CLAMPS, HOFFMAN'S SCREW COMPRESSOR.** Nickel-plated. Type 1665.

Size ..... inches	½ x ¾	½ x 1
Each	$0.45	.50

CLAMPS



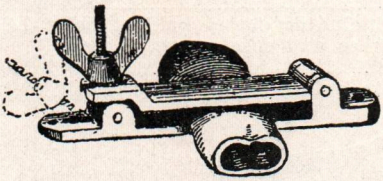
No. 4161A



No. 4161B

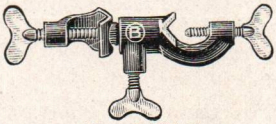
4161A **CLAMPS.** Lever spring compression, nickel-plated.
Size ..... inches ½ ⅜
Each ..... $0.50 .55

4161B **CLAMPS.** According to Bunsen, two bars with screws at each end, of brass, nickel-plated, extra heavy. Size, ¾ x 1½ in. $0.50



No. 4161C

No. 4161D



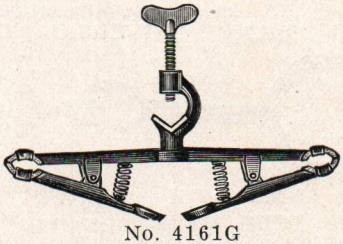
No. 4161E

4161C **CLAMPS, BUNSEN'S.** For heavy rubber tubing, can be screwed on table; to hold up to 2 inches $1.00

4161D **CLAMPS.** Holder, for attaching clamps, extension rings, ring burners, etc., to supports. Type 2290. Small ..... .50
Large ..... .75

4161E **CLAMPS.** Holder, universal, of two parts, swiveled; can be set to any angle. Type 2295. Small ..... .75
Large 1.25

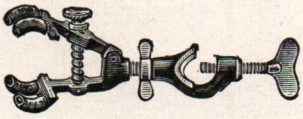
No. 4161F



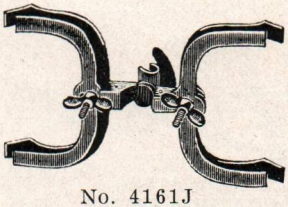
No. 4161G

4161F **CLAMPS.** For burettes, jaws open by pressing the lever and spring closing. Type 2300 ..... $0.60

4161G **CLAMPS.** For two burettes, with spring closing. Type 2305 ..... 1.25



No. 4161H



No. 4161J

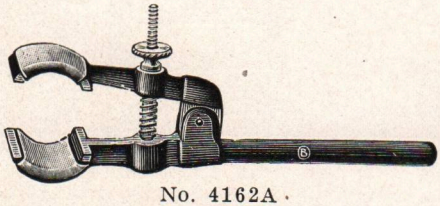
4161H **CLAMPS.** For burettes and tubes, with set screw. The jaws may be set at any angle. Type 2310 ..... $0.70

4161I **CLAMPS.** (Hoffman's), for two burettes 1.00

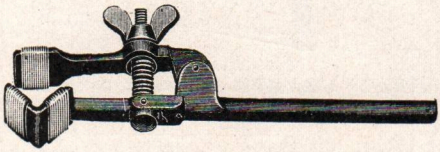
4161J **CLAMPS.** Double, of brass, for two burettes, most perfect made. It does not cover the graduations 3.00

4161K **BURNER FORK.** For holding burners on support stands ..... .35

CLAMPS



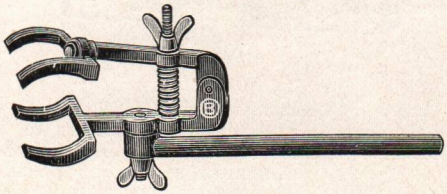
No. 4162A



No. 4162D

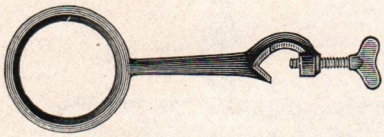
4162A **CLAMPS, BUNSEN'S.** For burettes, small size, including clamp holder. Type 2314 ..... each $0.75
4162B **CLAMPS, BUNSEN'S.** Large size, including clamp holder .. each 1.00
4162C **CLAMPS, BURETTE.** For small tubes and condensers, including clamp holder. Type 2318 ..... each 1.00
4162D **CLAMPS, BURETTE.** Large size, including clamp holder .. each 1.25

No. 4162E

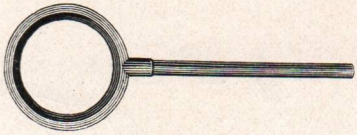


No. 4162G

4162E **CLAMPS, HOFFMAN'S,** of iron, single. Type 2320 ..... each $0.60
4162F **CLAMPS, UNIVERSAL.** The jaws arjust themselves to irregular shaped apparatus. Type 2322 ..... each 1.00
4162G **CLAMPS, UNIVERSAL.** Large size ..... each 1.25



No. 4162H



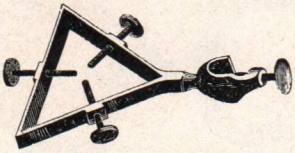
No. 4162I

4162H **RING.** With brass screw to attach to supports. Type 2325.

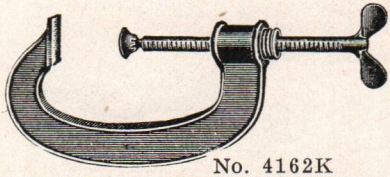
Diameter ..... inches	2	3	4	5	6	7
Each	$0.25	.30	.35	.35	.40	.45

4162I **RINGS, EXTENSION.** To attach with clamp holder. Type 2330.

Diameter ..... inches	2	3	4	5	6	7
Each	$0.30	.35	.40	.45	.50	.55



No. 4162J



No. 4162K

4162J **CLAMPS, BRASS.** Triangle with adjustable screws, to support different sizes of crucibles ..... each $2.00
4162K **CLAMPS, IRON.** For fastening apparatus to table.

Size opening ..... inches	2	3	4	5	6
Each	$0.55	.75	.95	0.00	1.45

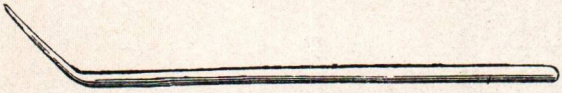
CLAMPS. Holding Platinum Wire Triangle. See Platinum.
CLAMPS. See also Supports.

COLOR TEST PLATES

COMBUSTION MATERIAL

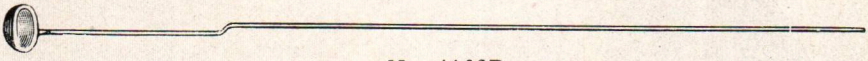
No. 4163C

No. 4163E



No. 4163E

No. 4163D



No. 4163D

4163A **COLOR PLATES,** glazed throughout, with exception of bottom surface. Type 580.

Size number	1	2	3	4
Dimensions, mm.	110x90	160x125	180x110	180x140
Number of depressions	12	12	24	30
Each	$0.70	.95	1.35	1.50

4163B **COLOR PLATES,** flat surface, glazed throughout, with exception bottom surface. Type 581.

Length, mm.	175
Width, mm.	137
Thickness, mm.	6
Each	$1.50

4163C **BOATS, COMBUSTION,** glazed throughout with exception of outside bottom surface, porcelain. Type No. 560.

Size number	0	1	2	3	4	5	6	7	8
Length, mm.	58	60	60	62	76	76	88	97	100
Width, mm.	10	7	10	8	10	11	12	18	20
Height, mm.	8	8	8	8	9	9	8	13	13
Each	$.22	.22	.22	.23	.24	.24	.25	.27	.28

4163D **COMBUSTION SPOONS.**

Size of cup	inches	½	1
Brass	each	$0.20	.25
Iron	each	$0.15	.20

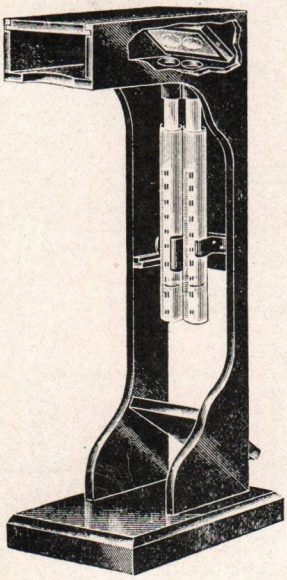
4163E **TUBES, COMBUSTION,** porcelain, suitable for high temperature work. Specify glazing desired. Type 661.

Size number	0	1	2	3	4	5	6	7
Outside diam., mm.	10	12.5	14	17	20	28	38	60
Inside diam., mm.	6	10.5	10	12	15	20	28	43
Length, mm.	1000	1000	1000	1000	1000	1000	1000	1000
Each	$5.60	5.60	5.60	6.30	7.00	8.40	11.20	14.00

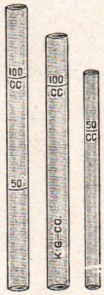
If longer or shorter lengths are required, add or subtract .01 of price for each centimeter.

Combustion Tubes, Silica, see Silica.

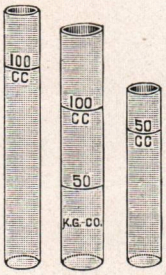
COLORIMETERS



No. 4164A



No. 4164B



No. 4164C

4164A **COLORIMETER, SCHREINER**—Designed by Oswald Schreiner of the Bureau of Soils, United States Department of Agriculture. This instrument is used by the United States Government and eliminates the objectionable features of some other instruments. All working parts coming in contact with the sample or standard are of glass. Broken parts can at any time be easily replaced. The instrument is fully described in Bulletin No. 31, United States Department of Agriculture, Bureau of Soils.

Price $20.00

Extra graduated tubes for above ..... $ 5.00

Extra plain tubes for above ..... $ 1.50

4164B **COLOR TUBES, NESSLER, WITH POLISHED BOTTOM.** For determination of ammonia in water. In sets of 2 agreeing.

Graduated cc.	50	100	50 and 100	50, 100 and 150
Each	$ .70	.90	1.00	1.50

4164C **COLOR TUBES, NESSLER, AMERICAN HEALTH ASSOCIATION.** With polished bottoms and 50 cc. mark 210 mm. high on 50 cc. tube, and 100 c.c. mark 325 mm. high on 100 cc. tubes. Tubes in selected sets of six or twelve guaranteed to have either 50 cc. or 100 cc. marks within 6 mm. of same height. See American Public Health Association, "Standard Methods of Water Analysis," 1912.

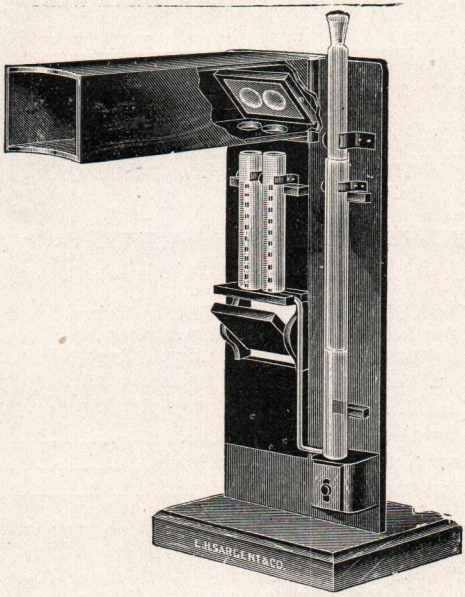
Graduation, cc	50	100	50 and 100
Each	$ 1.50	2.00	2.50
Per set of six	$10.00	13.00	16.50
Per set of twelve	$21.00	27.50	35.00

COLORIMETER

KENNICOTT COLORIMETER

Modified by

CAMPBELL-HURLEY



No. 4165A

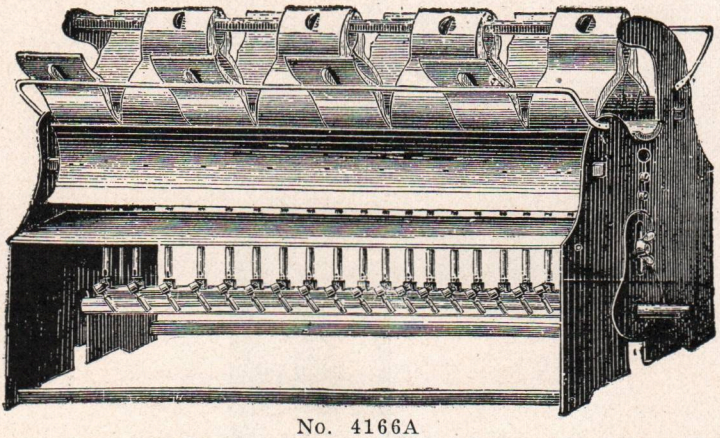
In this colorimeter the method of comparing the colors is similar to that used in a half shade polariscope, the field consisting of a circular disc of light divided vertically into two parts. The comparison tubes are those of the well known Kennicott instrument in which the unknown is placed in the left hand tube while the color is matched by raising or lowering the level of a standard solution in the right hand tube by means of a glass plunger working in the attached reservoir.

As the comparison tube for the standard and the reservoir are made in one piece, the liquid used for the standard solution comes in contact with glass only. When the two colors are of the same intensity, a person looking through the eye piece observs a singl circular field divided vertically by an almost imperceptible line representing the contact point of the hemispheres of the two comparison tubes.

This apparatus is admirably adapted to quantitative analysis when the calculation depends on color density such as is the case in the analysis of water, carbon in steel, titanium metal, etc., and may be advantageously used for the color values of dye stuffs, etc. Many other uses will naturally suggest themselves.

4165A Price each $20.00

COMBUSTION FURNACES



No. 4166A

4166A **COMBUSTION FURNACE, BUNSEN'S.** Latest and most improved form; each burner is provided with separate stopcock. Complete with tiles and clay and iron slides. Type 1663.

Number of burners	10	15	20	25
Each	$28.00	35.00	41.00	55.00

Extra clay tiles ..... per dozen $3.00
Extra clay troughs. 8 inches long ..... each $ .25
Extra clay troughs ..... each $ .50

4166B **COMBUSTION FURNACES, BUNSEN'S, 10 BURNERS.** For gasoline gas or natural gas. Same style as Type 1663, but provided with new "Universal" burners. Complete with tiles and clay and iron troughs for the tube $35.00

4166C **COMBUSTION FURNACE, GLAZER'S.** Modified by Anschutz and Kekule. With mica plates to permit watching the flame during combustion. The burners are movable and are provided with spring stopcocks and nickel plated air regulators. Complete with top plates of clay.

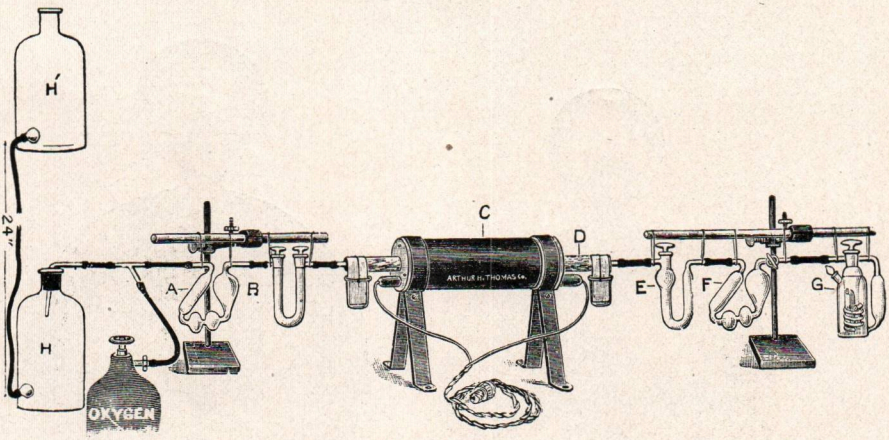
Number of burners	10	21	26
Each	$42.00	65.00	84.00

4166D **COMBUSTION FURNACES, FLETCHERS.** For heating tubes to high temperatures by use of gas and blast, with adjustable flame length. Length of furnace, 12 inches. Net $18.50

4166E **COMBUSTION TUBES, ALUNDUM.** See Tubes, Alundum.

4166F **COMBUSTION RECORDER,** for determining the percentage of CO_2 in flue gases. It is self-contained, compact, portable, and direct reading; practically instantaneous.

Pump sample into tank, close the stopcocks, shake, and read the percentage of CO_2 on the dial. Complete with necessary Reagents and directions for use $27.50



No. 4167A

COMBUSTION TRAIN, VANIER, for the determination of carbon in steel by the direct combustion method with electric furnace, consisting of the following:

H and H¹. 4 liter aspirator bottles for maintaining a constant pressure, H being filled with water.

A, potash bulb with caustic potash for purifying oxygen before entering tube.
B, calcium chloride tube, for removing moisture from oxygen before entering tube.
C, Hoskin electric combustion furnace.
D, glazed quartz combustion tube, ¾ inch bore and 2 feet long.
E, Vanier zinc tube for granulated zinc, to remove any trace of sulphur.
F, Vanier sulphuric acid bulb, for absorbing moisture.
G, Vanier combined potash bulb and drying tube.

The determination of carbon in steel is one of the principal duties of the steel chemist and when this analysis is made by the direct combustion method with proper furnace and absorption train, it becomes one of the most satisfactory analyses, both in point of time and in accuracy to be made in a steel laboratory. This combustion outfit is the design of Mr. Geo. P. Vanier, Chief Chemist of the Pennsylvania Steel Company, several of teh important components of the train being specially designed by Mr. Vanier for this apparatus. With this outfit one man can, with five outfits, maintain a rate of ten combustions per hour. An important feature of the outfit is the Vanier Combined Potash Bulb and Drying Tube (Patented) Fig. G of the illustration. It offers many advantages over the bulbs formerly used, I.e.—

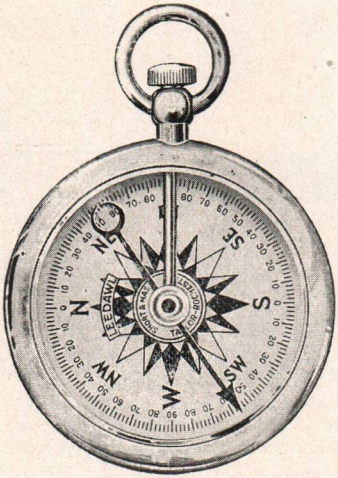
4167A **VANIER COMBUSTION TRAIN,** complete outfit as illustrated, consisting of aspirator bottles H and H'; bulbs A, B, E, F and G, Hoskin's Combination Furnace C, glazed quartz combustion tube D rubber tubing, supports, clamps, glass rods, two Alundum combustion boats, 3¾ x ⅝ inches, and ½ lb. of R. R. Alundum but without oxygen tank. Type 24958. ..... $65.00

4167B **VANIER COMBUSTION TRAIN,** complete as above, but with the addition of Hoskins Rheostat for regulating temperature of furnace. Type 24962. ..... $75.00

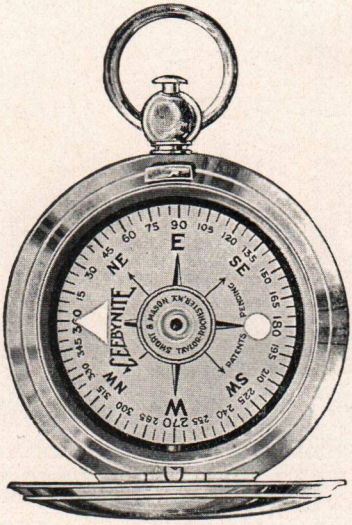
SINGLE PARTS

4167C **POTASH BULB.** A of illustration. Type 44732 ..... Price on application.
4167D **CALCIUM CHLORIDE TUBE.** B of illustration. Type 23252 ..... Price on app.
4167E **HOSKIN ELECTRIC COMBUSTION TUBE FURNACE.** C of illustration. Type 28988 ..... Price on application.
4167F **GLAZED QUARTZ COMBUSTION TUBE,** ¾ in. bore x 2 ft. long. D of illustration. Type 24954 ..... Price on applicaion.
4167G **VANIER ZINC TUBE.** E of illustration. Type 26656 ..... Price on application.
4167H **VANIER SULPHURIC ACID BULB.** F of illustration. Type 26660 ..... Price on application.
4167I **VANIER COMBINED POTASH BULB AND DRIVING TUBE.** G of illustration. Type 26664 ..... Price on application.
4167J **ALUNDUM COMBUSTION BOATS.** 3¾ in. x ⅝ in., each. Type 24918 ..... Price on application.
4167K **RR ALUNDUM.** In 1-lb. glass stoppered bottle. Type 24930 ..... Price on app.
4167L **FACTOR WEIGHT,** 2.7273 grams, of lacquered brass. For weighing charge of boat. Type 24964 ..... Price on application.

COMPASS



No. 4168A
(Actual size)



No. 4168B
(Actual size)

THE LEEDAWL COMPASS

The Leedawl Compass has been put on the market to meet the ever growing demand for a good, reliable, properly manufactured, attractive, accurate and sensitive pocket compass, at a reasonable price.

The "Leedawl" is mounted in an untarnishable white-metal case (not plated), has an untarnishable silver-metal dial, hardened and tempered steel point and cupped jewel bearing. The stop for the needle in the crown is made to prevent dust getting inside the instrument, besides making it practically water-tight.

The beveled crystal glass is made to snap in, a most desirable feature, since it can easily be removed to enable the working parts to be reached, and repaired or cleaned when necessary.

4168A **LEEDAWL COMPASS.** Type 2910.....each $1.00
White-metal case, beveled-glass crystal, jeweled needle, untarnishable silvered-metal dial, cupped jewel bearing. Packed each in a neat box, 12 in an attractive box for counter display.

THE CEEBYNITE COMPASS

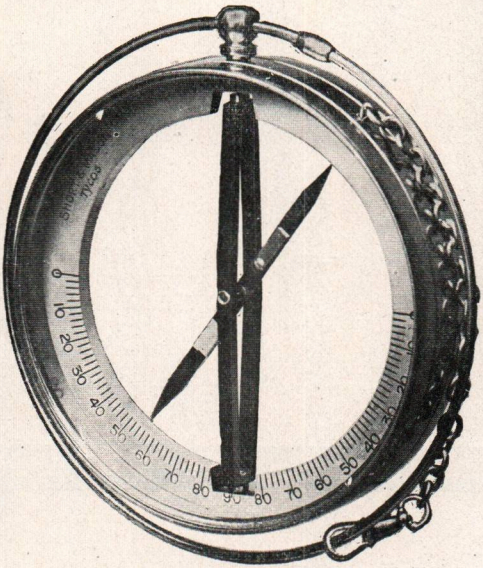
Supplied to Canadian and U. S. Armies

The North and South points of the floating dial of the Ceebynite Compass are treated with a radio-active compound (permanently luminous) which enables them to be seen at night. The action of this material is permanent and does not have to be exposed to sunlight during the day to make it phosphorescent, as do other compounds.

4168B....**CEEBYNITE COMPASS.** Type 2917.....each $3.00
Thin-model, white-metal hunter case, strongly hinged, beveled-glass crystal, floating dial with luminous points, automatic stop lift, silvered-metal dial. Packed each in an attractive box.

4168C **CEEBYNITE COMPASS.** Type 2917 .....each $6.50
Same as Type 2917, except in gold-filled case.

Tycos MINERS' COMPASS OR DIPPING NEEDLE



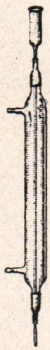
No. 4169 A

In the hands of the prospector, the Miners' Compass, or Dipping Needle, proves a serviceable guide to the discovery and location of magnetic iron ore. In this instrument the magnetic needle is carefully balanced upon a horizontal axis within a graduated circle, in which the needle will be found to assume a position inclined to the horizon. This angle of deviation is called the inclination or dip, and varies in different latitudes and even at dierent times in the same place. Hence, in reading the dip for the suspected presence of magnetic iron ore, the observer must be governed not only by his instrument, but must also draw into requisition his knowledge of the general geological formation of the place of his survey; and dependent on his experience, he wll be enabled to approximate as to the probable mass and depth of the ore from the surface. When used for tracing ore the observer should hold the ring in his hands and keep the needle north and south, standing with his face to the west. The inclnation of the needle as read off on the graduated scale will show the dip. If the compass is held horizontal it serves of course as an ordinary compass.

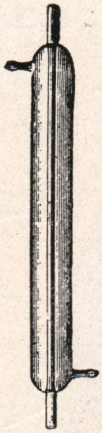
4169A **S. & M. *Tycos* DIP NEEDLE MINING COMPASS**.....$12.00
Three-inch diameter, in velvet-lined case. Weight 9 ounces.

4169B **S. & M. *Tycos* DIP NEEDLE MINING COMPASS**.....$20.00
Norwegian pattern, needle gimballed. Weight 8 ounces.

CONDENSERS



No. 4170A



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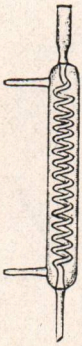
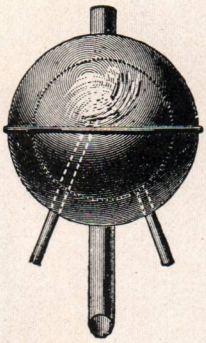


No. 4170C

No. 4170D



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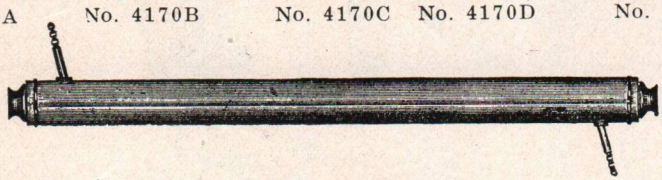


No. 4170G

4170A **CONDENSERS, LIEBIG'S.** Glass, with rubber connections.

Body ..... inches	12	18	24	30	40
Each	$2.00	2.25	3.15	5.00	6.50

4170B **CONDENSERS LIEBIG'S.** With condensing tube sealed in the glass body.

Body .....inches	10	12	15	20
Each	$1.70	2.00	2.50	3.15

4170C **CONDENSERS.** Glass, with condensing tubes in form of coil, sealed into water jacket, with adapter fused on.

Length of jacket.....inches	10	12	15
Each	$3.50	4.25	5.50

4170D **CONDENSERS, ALLIHN'S.** All glass.

Body .....inches	10	12	16	20	24
Each	$1.90	2.10	2.40	3.20	3.60

4170E **CONDENSERS, SOXHLET'S.** Ball shape, of metal—with 2 balls.
Diameter .....inches
Each $9.75

4170F **CONDENSERS, SOXHLET'S.** Ball shape, of metal, nickel-plated, diameter, 4 inches.....$3.75

4170G **CONDENSERS, LIEBIG'S.** Brass, inside tube of glass.

Length .....inches	15	20	30	40
Each	$4.50	5.00	6.00	8.00

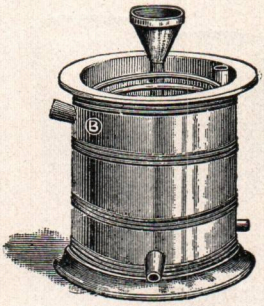
4170H **CONDENSERS, HALLOCK'S.** Of copper, with pure block of tin condensing coil; has two rods for support; size, 14½x4 in...$7.50

4170I **CONDENSER TUBES.** Of glass, with adapters.

Length .....inches	20	25	30	35	40
Each	$0.35	.45	.55	.65	.75

CONDENSERS. See also Stills and Condensers.

CONDENSERS



No. 4171C

4171A **CONDENSER, SULPHUROUS ACID, FISCHER'S,** with two glass stop-cocks on vertical tubes $3.75

4171B **CONDENSER, SULPHUROUS ACID, LIEBIG'S,** with two glass stop-cocks on horizontal tubes $3.75

4171C **CONDENSERS, ZINC,** with heavy block tin worn, for use with Distilling Apparatus No. 4148.

No.	A	B	C	D	E
For still, capacity, gallons	½	1	2	3	5
Height over all, inches	6 ⅜	7	10 ¼	14 ⅜	15 ⅝
Diameter outside, inches	5 ⅜	7	8 ¼	9 ¾	12 ⅝
Diameter of tin tube, inches	⅜	⅜	⅜	½	⅝
Each	$5.50	7.00	8.75	11.50	15.00

No. 4171D

4171D **CORK BORERS.** Hard brass, well finished.

Sets of pieces (number)	3	6	9	12	15
Each	$0.60	1.00	1.75	2.25	3.00

CORK BORES. Brass, with handle.

Sets of pieces (number)	3	6	9	12	15
Each	$1.20	2.20	3.20	6.00	8.00

No. 4171E

No. 4171H

4171E **CORK BORER,** Sharpener. Each $2.00

4171F **CORK EXTRACTOR,** folding form. Each ..... .25

4171G **CORK GAGE,** of aluminum. Each ..... .25

4171H **CORK KNIFE.** Each ..... .35

4171I **CORK PRESS,** Lever Mold. Each $1.00

4171J **CORK PRESS,** Rotary, taking cork ¾-inch. Each 1.50

4171K **CORK PRESS,** Rotary, taking cork 1¼-inch. Each 2.00

4171L **CORK SCREWS,** good quality. Each ..... .75

CORKS

No. 4172A

4172A CORKS, XX, regular length.

Number	1	2	3	4	5	6	7	8	9	10
Diam. of small end, in.	¼	5/16	⅜	7/16	½	9/16	⅝	21/32	11/16	¾
Per gross	$0.40	.45	.55	.60	.70	.75	.80	.85	1.00	1.10
Per doz.	$0.05	.06	.07	.09	.09	.10	.11	.12	.15	.16
Number	11	12	.13	14	15	16	17	18	19	20
Diam. of small end, in.	13/16	⅞	15/16	1	1 1/16	1⅛	1 3/16	1¼	1 5/16	1⅜
Per gross	$1.15	1.25	1.40	1.60	1.80	2.00	2.20	2.35	2.60	2.85
Per doz.	$0.18	.19	.20	.25	.26	.28	.30	.33	.36	.40

4172B CORKS, BEST QUALITY XX, regular length, assorted. Nos. 4 to 15 inclusive.....Per gross $1.35

4172C CORKS, BEST QUALITY XXX, regular length.

Number	1	2	3	4	5	6	7	8	9	10
Per gross	$0.54	.55	.68	.78	.85	.95	1.05	1.15	1.40	1.60
Per doz.	$0.07	.08	.09	.10	.11	.12	.15	.17	.21	.23
Number	11	12	13	14	15	16	17	18	19	20
Per gross	$1.70	1.90	2.10	2.40	2.80	3.20	3.50	3.55	3.95	4.30
Per doz.	$0.25	.28	.30	.35	.40	.45	.47	.50	.55	.60

4172D CORKS, FLAT, for wide mouth bottles, XX quality, ¾-inch thick.

Diam. of large end, in.	1	1⅛	1¼	1⅜	1½	1⅝	1¾	1⅞	2	2⅛
Per doz.	$0.16	.20	.25	.28	.32	.38	.45	.50	.52	.55
Per gross	$1.30	1.60	1.95	2.25	2.60	3.00	3.45	4.00	4.15	4.70
Diam. of large end, in.	2¼	2½	2⅝	2¾	3	3½	4	4½	5	6
Per doz.	$0.65	.85	.95	1.05	1.30	2.00	2.85	3.80	4.80	7.55
Per gross	$5.40	7.10	8.05	9.00						

4172E CORK, SHEET, 4x12 inches.

Thick, inches	1/16	⅛	3/16	¼
Each	$0.10	.17	.25	.30
Per dozen	$0.75	1.35	1.95	2.40

For all other sizes and shapes of Corks, write for special prices, etc.

GRAPHITE CRUCIBLES

THEIR CARE AND USE

Many foundrymen do not fully appreciate the importance of keeping and handling their crucibles in a manner which will insure the greatest number of heats with he least danger of accidents, and this is published to emphasize this point.

The importance of the subject seems to be underestimated, and crucible users will find it to their advantage to give the mater more thought and atention, and instruct their furnace men, melters and other employees accordingly.

As any defect in, or accident to, a crucible is an exceedingly annoying as well as an expensive matter, and as such occurrences are in most cases due to improper or careless methods in the annealing or handling of crucibles, the suggestions embodied on this page should prove valuable, as they are the result of long experience and the best thought and knowledge on the subject.

It is very important that the crucible should be properly annealed in a temperature of at least 250 degrees Farenheit before using.

Concerning a proper method of annealing, there can be no fixed rule, as conditions differ; but it is the general practice to anneal on the top of the furnace, although some foundries are equipped with a furnace used exclusively for this annealing purpose, and it is an interesting fact that such foundries never have "scalped" crucibles.

Whether annealing in a special furnace or on top of the crucible furnace, there are four points that must be observed.

First: The temperature must go above 250 degrees Fahrenheit.

Second: This temperature should be reached gradually.

Third: This temperature must be held a sufficient time to allow the moisture to thoroughly disappear.

Fourth: The crucible must go in the crucible furnace with a temperature above 250 degrees Fahrenheit.

For example, with a No. 200 crucible it should take at least ten hours to bring it up to this degree. It should "soak" in the heat fully ten hours and then be charged and go in the furnace at about this heat.

Some foundries practice the first, second and third rules perfectly and "fall down" entirely on the fourth by hurriedly and carelessly taking the crucible from the furnace and placing it on damp sand or a cold furnace floor and allowing it to stand there indefinitely before charging.

A failure to comply with this fourth rule conteracts all that the other three have accomplished, and the crucible maker may be informed that his pots are "no good."

Unless the annealing is carefully done, however, hidden cracks, flaks or fissures may be present which, under strong heat, may cause pin holes and similar defects to make their appearance.

Pin holes are one of the chief difficulties that the user of crucibles meets. Crucibles do not usually show this defect until hey have been in use for some time. It seems to require a number of heats to develop this defect.

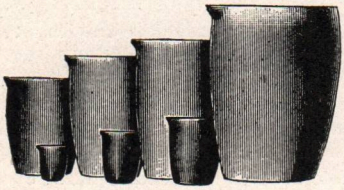
Pin holes are usually discovered by metal dropping down into the furnace pit, and when the crucible is removed a stream of metal will be found trickling down its side.

Pin holes are probably small fissures developed either during the drying or the annealing of a crucible, and there seems to be no way of avoiding an occasional defect of this kind.

Note—Courtesy of Joseph Dixon Crucible Co., from their booklet "Crucibles, Their Care and Use."

STANDARD SIZES OF *Massco* CRUCIBLES

BLACK LEAD OR PLUMBAGO



No. 4174A

No.	Height Outside ins.	Diam. at Top Outside ins.	Diam. at Bilge Outside ins.	Diam. at Bottom Outside ins.	Capacity in Liquid Pints	Price
0	2	1½	1½	1 3/16	.....	$4.50 per doz.
00	2¼	1 13/16	1 13/16	1½	.....	4.50 per doz.
000	2½	1 15/16	1 15/16	1½	.....	4.50 per doz.
0000	2 15/16	2⅜	2⅜	1¾	¼	4.50 per doz.
1	3⅝	3¼	3⅛	2¼	½	.75 each
1½	4	3½	3¾	2⅜	⅝	.75 each
2	4½	3¾	3 11/16	2⅞	¾	.90 each
3	5¼	4¼	4⅛	3	1	1.00 each
4	5⅝	4⅝	4 9/16	3 3/16	1½	1.25 each
5	6	4⅞	4⅞	3½	1¾	1.55 each
6	6½	5⅛	5¼	3⅞	2¼	1:80 each
7	6¾	5½	5½	4	2½	2.00 each
8	7⅛	5¾	5⅞	4¼	3	2.25 each
9	7⅝	5⅞	6¼	4¾	3½	2.60 each
10	8	6⅛	6 9/16	4 13/16	4 1/10	2.80 each
12	8¼	6¾	6¾	5	4½	.19 per No.
14	8⅝	7	7¼	5½	5 3/10	.19 per No.
16	9½	7¼	7¾	5½	7 3/10	.19 per No.
18	10	7½	8	5½	7 7/10	.19 per No.
20	10⅜	7¾	8½	6¼	9 3/10	.19 per No.
25	11	8¼	9	6¼	11 4/10	.18 per No.
30	11½	8¾	9⅜	7	13 2/10	.18 per No.
35	12¼	9⅜	10	7¼	16 4/10	.18 per No.
40	12¾	9⅝	10½	7⅝	18 8/10	.18 per No.
45	13¼	10	10⅞	7¾	21 1/10	.18 per No.
50	13½	10¼	11½	8	23 2/10	.18 per No.
60	14⅛	10½	11½	8½	24 4/10	.18 per No.
70	14⅞	10¾	12	8½	29 2/10	.18 per No.
80	15½	11½	12½	8½	32 6/10	.18 per No.
90	16	11¾	12¾	9	38 3/10	.18 per No.
100	16½	12¼	13¼	9½	39 3/10	.18 per No.
125	16¾	12½	14	10	44 5/10	.18 per No.
150	19	13½	14⅞	10⅜	49 6/10	.18 per No.
175	19¾	14⅜	16	11	65½	.18 per No.
200	20⅜	15	16¾	11⅞	76	.18 per No.
225	20⅞	15	16¼	12½	84	.18 per No.
250	21	15½	17¼	11¾	88	.18 per No.
275	22½	15	17⅛	12½	92	.18 per No.
300	22½	16¼	17⅝	12¾	103	.18 per No.
400	24½	17½	19½	14	139	.18 per No.

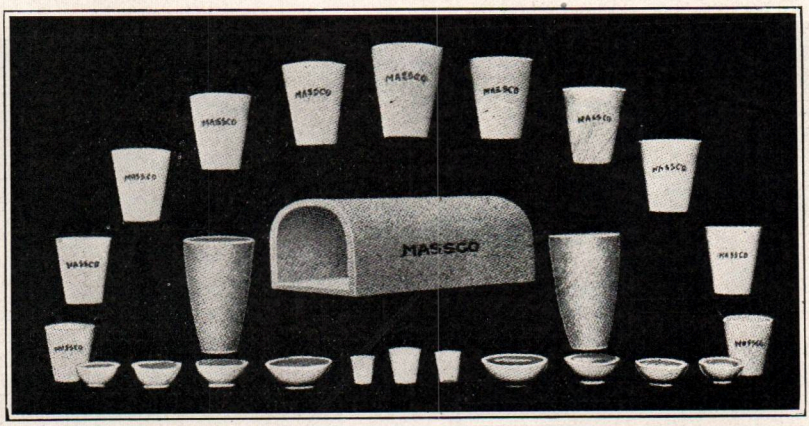
4174B CRUCIBLE COVERS, BLACK LEAD.

No.	1 to 5	6 to 10	12 to 20	25 to 300
Each	$0.45	.55	.65	.05

All sizes of covers above No. 12 per No. at 2½ cts.

4174C CRUCIBLE STIRRERS, BLACK LEAD. Length 8 in.....each $0.55
4174D CRUCIBLE STIRRERS, BLACK LEAD. Length 14 in.....each .85
4174E CRUCIBLE STIRRERS, FIRE CLAY. Length 17 in.....each 1.25
MASSCO CRUCIBLES AND RETORTS, quoted upon application.

Massco CLAY GOODS



No. 4175A

4175A *Massco*, **CLAY GOODS,** for which we are sole agents, are manufactured from the highest grade clay by expert clay workers of many years of experience, making use of many experiments upon all different makes, as well as their own. We can say with confidence that the "Massco" Crucibles, Scorifiers and Muffles will give the assayer entirely satisfactory service, and reduce his expense for these items to a minimum.

These crucibles are not excelled for cleanness of pouring and evenness of cutting; as the botom is small, the lead button is not spread out over a large surface and in danger of a portion being lost.

Crucibles are subjected to the most severe service imaginable. The abrupt heating induces strains due to expansion which are hard to withstand. In addition to this, they are subjected to a chemical action on account of the charge within. Our crucibles will meet these most exacting necessities, but in order to reduce the strains to a minimum, we wish to state the following:

MAXIMS FOR THE CARE OF CRUCIBLES

1. Crucibles, on account of the texture necessary, must be more or less fragile, and despite the utmost care in packing, there is bound to be some breakage, or at least cracking in transit. It is well, therefore, to examine crucibles before use for such cracks, tapping them to hear the clear ring of sound crucibles, as otherwise a crack too small to be noticed casually may cause considerable annoyance, loss of time and patience and damage to he muffle.

2. Crucibles should be dry before use. In putting crucibles into a furnace, it is well to bring up the heat as evenly as possible. Clay is a very poor conductor of heat, and the crucible may be very hot in one spot and considerably cooler on the inside or on the other side, thus producing a very severe strain. This is especially true of open crucible furnaces where the gasoline flame strikes the crucible directly. In the *Massco* Furnace, this objection has been overcome.

In putting crucibles into a hot coke fire, it is well to put on a little fresh fuel and then set the crucibles in this green fuel.

3. Remember that the flux may not only act upon the ore, but also upon the crucibles, and sometimes a slight change in the flux will not make the slag less liquid and yet may reduce the corroding effect upon the crucible considerably. The introduction of a little silica often protects the crucible, and makes the slag more fluid.

Massco CLAY CRUCIBLES

No. 4176A

4176A **CRUCIBLES, *Massco* CLAY.** These crucibles are made in both hard and soft burn, the hard being the most generally used. Type 1512.

Capacity ....grm.	5	10	12	15	20	30	35	40
*Price per 100	2.75	3.35	3.75	385	4.40	6.60	6.90	8.80
Height....in.	2⅝	3	3¼	3½	3¾	3⅞	4¾	5⅝
Diam. at top....in.	2⅜	2⅝	2¾	2⅞	3	3½	3¼	3⅜
No. to bbl	850	500	450	400	350	250	75	250
Gross wt....lbs.	260	240	240	240	240	255	250	240

*Crucibles in less than barrel lots, $0.25 to $0.50 per hundred higher.

4176B **COVERS FOR ABOVE.**

Size for....grm.	5	10	12	15	20	30	35	40
Price per 100	2.50	2.50	3.00	3.00	4.00	6.00	6.00	6.00

4176C **CRUCIBLES, *Massco* CLAY.** Tall, narrow form, superior for gas, gasoline, or coke furnaces. Type 1516.

Number	6 or D	8	9
*Price per 100	$3.60	7.00	9.00
Height ....in.	4	5	5¾
Diam. at top....in.	2¼	2½	3
No. to bbl	450	300	250
Gross wt. ....lbs.	225	235	255

*Crucibles in less than barrel lots, $0.25 to $0.50 per hundred higher.

4176D **COVERS FOR ABOVE.**

Size for	6 or D	8	9
Price per 100	$4.00	7.70	10.00

4176E **CRUCIBLES, *Massco* CLAY.** Round form.

No.	C	D	E	F	G	H	J	K
Height ....in.	3½	4	4½	5	5⅝	5⅞	6⅝	7¼
Diam. ....in.	2¼	2⅜	2⅞	3	3⅜	3¾	4⅜	4¾
Per 100	3.60	4.00	6.05	7.50	8.50	10.20	16.50	20.00

4176F **COVERS.**

Per 100	2.50	2.50	4.00	5.00	6.00	7.00	9.25	9.25

4176G

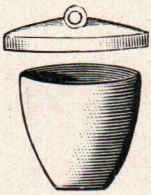
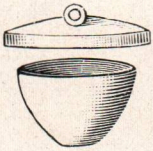
No.	L	M	N	O	P	Q	R
Height ....in.	8	8½	9⅜	10	11	12	13
Diam. ....in.	5¼	5¾	6½	7	7¾	8⅜	9⅜
Per 100	40.00	55.00	66.00	88.00	100.00	165.00	220.00

4176H **COVERS.**

Per 100	10.00	12.00	15.00	17.50	20.00	22.50	25.00

COORS PORCELAIN CRUCIBLES

MADE IN THE U. S. A.

No. 4177A

4177A We recommend to you Coors Chemical and Scientific Porcelain as being of the highest standard in its resistance to heat, acids, alkalies and sudden changes of temperature.

The prices quoted in this list are standard with all Dealers. A discount of 20% f. o. b. your city will be allowed on orders amounting to $100 or more at one time when you request your Dealer to have shipment made direct from Golden, Colorado.

4177A **CRUCIBLES,** high form, glazed throughout, with exception of outside bottom surface. Type 511.

Size, number	000	00	0	1	1a	2	3	4	5
Diameter rim, mm.	26	30	35	41	45	52	62	72	87
Diameter bottom, mm.	12	14	17	20	21	25	30	34	40
Height, mm.	19	25	27	35	40	43	50	59	72
Capacity, c.c.	5	10	15	30	40	57	95	155	280
Each	$0.09	.12	.15	.24	.28	.30	.35	.45	.55

4177B **CRUCIBL ECOVERS,** for high form crucibles. Type 511a.

Size, number	000	00	0	1	1a	2	3	4	5
Diameter, mm.	32	35	42	47	56	59	73	81	95
Each	$0.05	.05	.05	.07	.09	.09	.12	.12	.15

4177C **CRUCIBLES,** low form, glazed throughout, with exception of outside bottom surface. Type 512.

Size number	0000	000	00	0	1	2	3	4	5
Diameter rim, mm.	18	32	37	41	46	56	67	81	96
Diameter bottom, mm.	8	13	15	15	18	18	23	29	35
Height, mm.	12	19	21	25	29	36	44	52	65
Capacity, c.c.	2.5	8	12	17	30	50	90	145	265
Each	$0.09	.12	.15	.18	.25	.34	.43	.50	.62

4177D **CRUCIBLE COVERS,** for low form crucibles. Type 512a.

Size number	0000	000	00	0	1	2	3	4	5
Diameter, mm.	22	39	44	47	52	65	76	88	107
Each	$0.05	.05	.05	.07	.07	.08	.12	.15	.18

COORS PORCELAIN CRUCIBLES

MADE IN THE U. S. A.

4178A **CRUCIBLES, GOOCH**, glazed inside and outside with straight sides and solid perforated bottoms. Type 517.

Size number	1	3
Diameter top, mm.	33	39
Diameter, bottom, mm.	20	26
Height, mm.	33	40
Capacity, cc.	15	25
Each	$0.35	.40

4178B **CRUCIBLES, CALDWELL**, glazed inside and outside with open flange bottom to hold perforated discs. Type 516.

Size number	1	3
Diameter top, mm.	33	39
Diameter, bottom, mm.	20	26
Height, mm.	33	40
Capacity, cc.	15	25
Each	$0.30	.35

4178E **CRUCIBLES, GOOCH**, with perforated bottoms, glazed throughout with exception of outside bottom surface. Type 513.

Size number	2	2a	3	4
Dia. rim, mm.	27	33	35	40
Dia. bottom, mm.	18	20	22	25
Height, mm.	30	33	40	43
Capacity, cc.	10	20	25	35
Each	$0.30	.35	.40	.45

4178G **CRUCIBLES, ROSE**, unglazed. Type 514.

Size number	1	2	3
Dia. rim, mm.	30	35	50
Dia. bottom, mm.	19	23	23
Height, mm.	38	40	50
Capacity, cc.	15	30	60
Each	$0.18	.27	.30

4178C **CRUCIBLE COVERS**, for Gooch Crucibles. Type 517a.

Size number	1	3
Diameter rim, mm.	40	46
Each	$0.05	.07

4178D **CRUCIBLE COVERS**, for Caldwell Crucibles. Type 516a.

Size number	1	3
Diameter rim, mm.	40	46
Each	$0.05	.07

4178F **CRUCIBLE COVERS**, for Gooch Crucibles. Type 513a.

Size number	2	2a	3	4
Diameter, mm.	35	39	42	47
Each	$0.05	.05	.05	.07

4178H **CRUCIBLE COVERS**, for Rose Crucibles. Type 514a.

Size number	1	2	3
Diameter, mm.	38	42	59
Each	$0.06	.07	.09

4178I **DELIVERY TUBES**, for Rose Crucibles. Type 514b.
Size number 1; diameter, 5.5 mm.; length, 140x30 mm. Each $0.72

4178J **CRUCIBLES**, of special shape, with large filtering surface for bitumen determination. Type 515.
Diameter rim, 45 mm.; bottom, 35 mm.; height, 24 mm. Each .50

4178K **CRUCIBLES**, cylindrical form. Type 518.
Diameter rim, 30 mm.; height, 32 mm.; capacity, 15 cc. Each .25

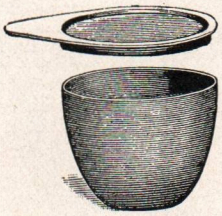
4178L **CRUCIBLES, GOOCH**, with two holes for suspending in Extraction Apparatus. Type 513b.
Size number 3; diameter rim, 35 mm.; capacity, 25 cc. Each .40

GOOCH CRUCIBLES with false bottoms. No. 1, $0.45; No. 3, $0.50.

CRUCIBLES ALUNDUM: See Alundum Ware.

CRUCIBLES

No. 4179A



No. 4179B

4179A **CRUCIBLES,** made of sheet iron, with lid.

Capacity ....cc.	20	50	100	200	400
Diameter ....inches	1 1/2	2 1/8	2 1/2	3 1/8	3 3/4
Height ....inches	1 1/4	1 1/2	2	2 3/8	3
Price ....each	$0.25	.30	.40	.50	.75

4179B **CRUCIBLES,** of sheet copper, with lids.

Capacity ....cc.	20	30	50	75	100	150	250
Diameter .... inches	1 1/2	1 5/8	1 3/4	2	2 3/8	2 3/4	3 1/4
Height .... inches	1 3/8	1 3/4	2	2 1/4	2 1/2	2 3/4	3 1/4
Price ....each	$0.75	.85	.95	1.10	1.50	1.75	2.60

4179C **CRUCIBLES,** of sheet nickel, for alkaline fushions. With covers.

Capacity .... cc.	20	30	75	100	250	500
Diameter ....inches	1 1/2	1 5/8	2	2 3/8	3 1/4	4
Height ....inches	1 3/8	1 3/4	2 1/4	2 1/2	3 1/4	3 5/8
Price ....each	$1.40	1.60	2.20	2.80	6.00	7.00

4179D **CRUCIBLES,** of pure silver, with lids.

Capacity .... cc.	20	30	50	75	100	150
Diameter ....inches	1 1/2	1 5/8	1 3/4	2	2 3/8	2 3/4
Height ....inches	1 3/8	1 3/4	2	2 1/4	2 1/2	2 3/4
Weight (about) gram.	35	45	60	80	100	150

Price, per gramms, on application.

4179E **CRUCIBLES, PURE SOLID NICKEL**—Gooch form with perforated bottom and extra cup. Capacity 30 cc., diameter top 38 mm., height 40 mm....each $2.25

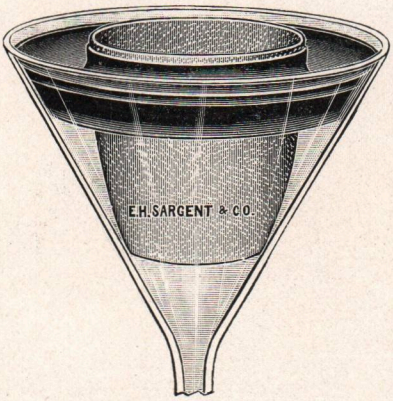
4179F **CRUCIBLES, PURE SOLID NICKEL**—Kawin's form, diameter 28 mm., height 15 mm. Used in the muffle for burning off filter paper in silicon determinations in iron....each .50

4179G **CRUCIBLES, PURE SOLID NICKEL**—Pennock & Martin's, for the rapid and accurate determination of sulphur in coke and coal. With hole in cover for insertion of igniting wire. Capacity 40 cc., diameter 38 mm., height 45 mm. Each 2.75

4179H **CRUCIBLES, SILICA.** See Silica Ware.

4179I **CRUCIBLES OF PLATINUM.** See Platinum.

CRUCIBLES



No. 4180A

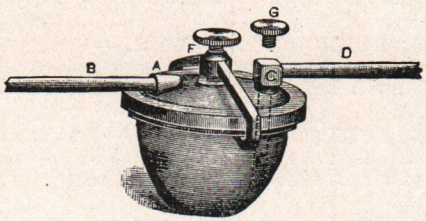
No. 4180B

4180A **CRUCIBLE HOLDER, SARGENT'S,** for filtering crucibles. Can be instantly installed or removed for cleaning. Will fit any ordinary sixty degree funnel. Can be used with any crucible on the market, such as Gooch, Caldwell or porous Aluminum styles. Made of one piece of soft rubber in three sizes only.

Size No.	1	2	3
For crucibles, top diam., mm.	27	35	40
Each ....Net	$0.30	.35	.40

4180B **HOLDER, SARGENT'S,** replaceable flange type. Has all the good points of No. 1491 and in addition has the advantage of greater ease of manipulation as well as provision for the easy replacement of the soft flanges when desired. Made of hard rubber with pure gum flanges. Can be made to order in any size.

Size No.	1	2	3
For crucibles, top diam., mm.	27	35	40
Each ....Net	$1.50	1.50	1.50

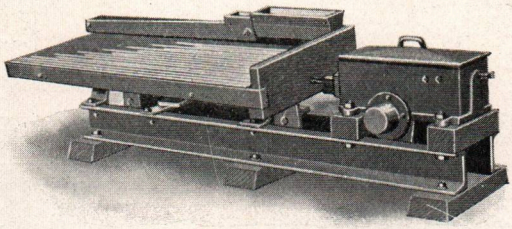


No. 4180C

This crucible is made for making oxygen from MnO_2, calcination of chalk with recovery of the expelled CO_2, manufacture of soda from cryolite, preparation of ammonia, destructive distillation of coal, wood or other organic substances, or for any use in which the materials employed or evolved do not act destructively on hot iron.

4180C **NORMAL SCHOOL CRUCIBLE.** 1½ oz. capacity....$1.50
4180D **SAME,** 6 oz. capacity....$2.00

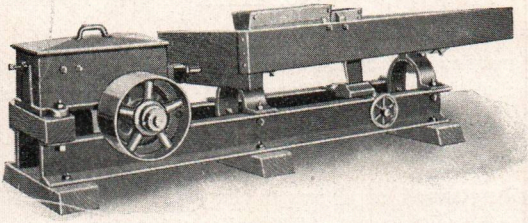
LABORATORY WILFLEY CONCENTRATOR



No. 4181A

Tailings Discharge Side
No. 13 Right Hand
LABORATORY WILFLEY CONCENTRATOR
(Deck 13½ in. wide x 30 in. long)
With enclosed Self-Oiling Head Motion and Special Bearings

4181A A laboratory size Wilfley Table is complete in every detail. Enclosed head motion tilting device and two interchangeable decks with Wilfley roughing and finishing riffles. A duplicate of our large tables at a low cost. There is a service station within reach of you where you can always obtain extra parts or assist you in the solving of your concentration problems which is just an example of our *Massco* service.



No. 4181B

(Feed Side)
No. 13 Right Hand
LABORATORY WILFLEY CONCENTRATOR
(Deck 13½ in. wide x 30 in. long)
With enclosed Self-Oiling Head Motion and Special Bearings

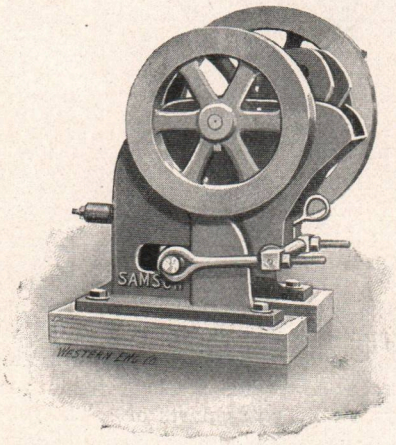
Price, includes one deck riffled for coarse and one for fine.....$100.00

F. O. B. Denver. Weight, 150 pounds.

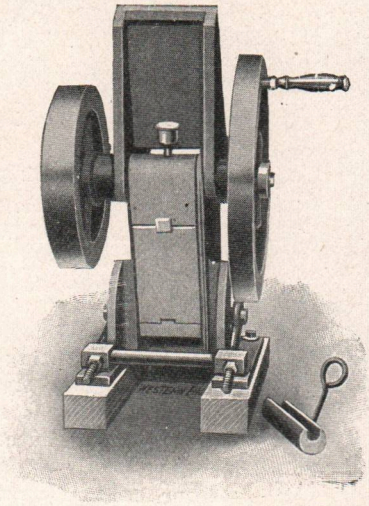
SAMSON LABORATORY CRUSHERS

Type 00

CLOSED



OPEN FOR CLEANING



No. 4182A

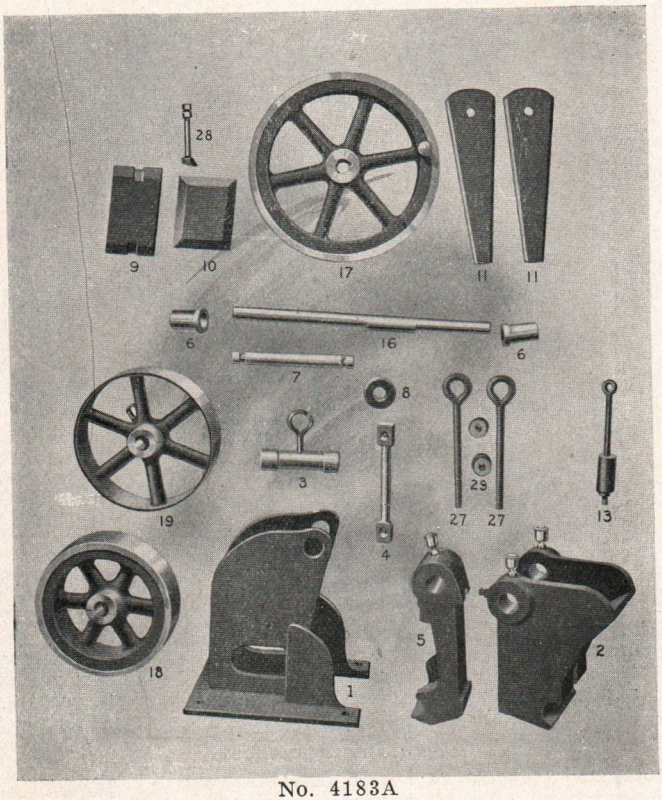
4182A For laboratory and assay office use, Samson Laboratory Crushers are one of the best machines of their kinds on the market.

It is extremely simple, has a large capacity, requires only a limited amount of power and can be operated either by hand or with a belt.

It can be easily cleaned, as shown in the cut, by pulling down the eye bolt on the front oscillating journal seat. This allows the front journal to drop down, the swinging frame that holds the stationary jaw plate to be turned up as shown, exposing the stationary as well as the movable and side plates for cleaning. No tools are required to open and close this crusher, and the time required is but an instant; it can be opened and cleaned while running at full speed.

		Jaw Opening Inches	Size Pulley Inches	Speed R. P. M.	Weight Pounds	Horse Power	Price with T and L. Pulley
4182B	Type 00	1½x4	12x3	500	300	1	$90.00
4182C	*Massco*	¾x3	12x1½	500	250	¾	$50.00

SAMSON LABORATORY CRUSHERS

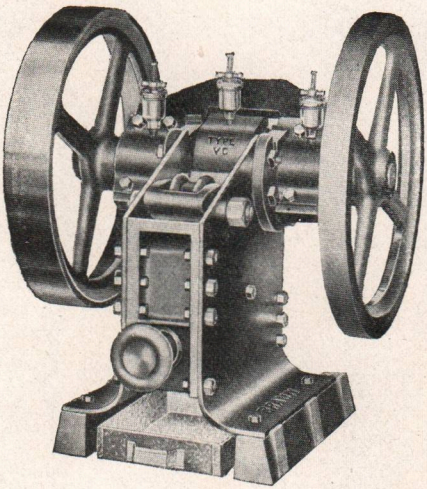


No. 4183A

Repair Parts

No.	Description	No. 00	Massco
1.	Main Frame	$20.00	$12.00
2.	Swinging Frame	16.00	9.50
3.	Front Oscillating Journal Seat	4.00	3.00
4.	Front Oscillating Journal	4.00	2.50
5.	Jaw	12.00	7.00
6.	Eccentric Shaft Journal Boxes (2), each	4.50	3.00
7.	Rear Tie Bar Shaft	2.00	1.50
8.	Collar	1.50	------
9.	Movable Jaw Plate, Steel	5.00	3.00
10.	Stationary Jaw Plate, Steel	5.00	3.00
11.	Check Plaets Hard Iron (2), per pair	2.50	1.70
13.	Eyebolt and Spring	1.50	2.00
16.	Eccentric Shaft, Tight Pulley Only	10.00	6.00
16.	Eccentric Shaft, T and L Pulley	11.00	------
17.	Flywheel	8.00	8.00
18.	Flywheel Pulley	12.00	8.00
19.	Loose Pulley	6.00	------
23.	Tie Bar Nuts (2), each	.50	.50
27.	Tie Bars (2), each	1.50	1.50
28.	Jaw Plate Bolt	.50	.50

BRAUN CHIPMUNK CRUSHERS



4184A

Steel Frame Laboratory Crushers

Type VC, Nos. 12 and 14, Small Size

418 A The large capacity of the Chipmunk Crusher, permitting its use for crushing great quantities of ore, and the demand of large operators for a laboratory machine of the Chipmunk type with substantial bearings that could be easily renewed, resulted in our designing the Types VC and WC Chipmunk Crushers.

General Construction

The frame is made of steel, each side plate being made in one piece, both rigidly secured together with the arched bearing casting, the front spacer casting and the toggle block. Strength, durability, and lightness are secured by the employment of steel frames.

The vibratory jaw is mounted upon an accentric at its upper end and rests against a toggle at its lower end. The eccentric imparts a circular or gyratory movement to the upper end while the toggle compels the lower end to describe an arc of a small circle; this motion is both forward and downward and impels the discharge.

Bearings

The bearings are lined with the best phosphor bronze split bushings which can be taken up when slightly worn or renewed when needed. All bearings are provided with grease cups.

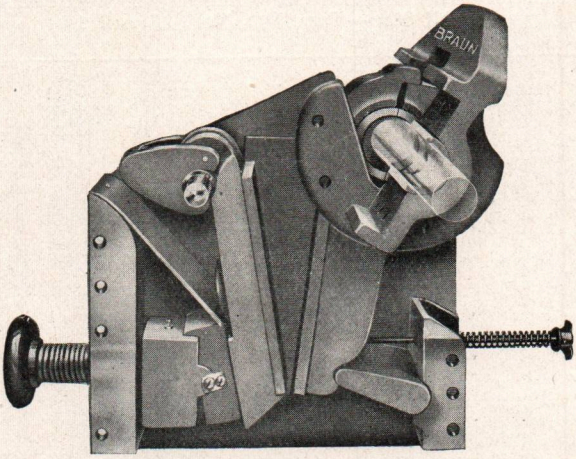
Improved Adjustment

The new adjustment is by means of an adjusting screw which passes through the front spacer casting and fits into the recess in the adjusting block; this block engages with a service block which presses against the stationary jaw. This device allows close adjustment, is strongly constructed and easily manipulated.

Cleaning

The stationary jaw is simply lifted out of its chamber permitting thorough cleaning of its interior parts.

BRAUN CHIPMUNK CRUSHERS



Sectional View

No. 4185A

(Patented Feb. 2, 1905; Nov. 26, 1912)

Type WC, Nos. 16 and 18, Large Size

Capacity

It has the greatest capacity, (size of jaws considered) of any crushing device.

Type VC, Nos. 12 and 14, are the smaller size crusher. When hand fed they will reduce rock from about 2¼ inches down to ¼ inch and smaller at a rate of from 300 to 400 pounds per hour, and when fed through a hopper, from 400 to 500 pounds per hour.

Type WC, 16 and 18, the larger size, are intended for handling larger quantities of material. When had fed their capacity runs from 1,000 to 1,500 pounds per hour, and when fed through a hopper, from 1,500 to 2,000 pounds per hour.

For renewal parts see pages 103 and 104.

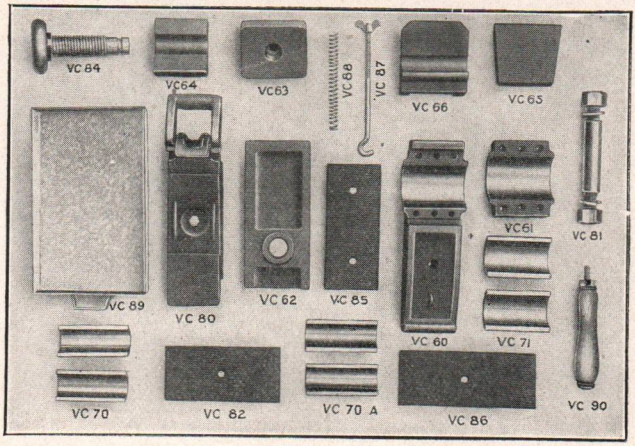
BRAUN CHIPMUNK CRUSHER TYPE VC	Capacity Pounds per hour	RPM	Dimensions of Pulleys Inches	HP	Size of Jaws Inches	Opening of Jaws	Dimensions Over All Inches: Length	Width	Height	Weight Pounds: Net	Packed	Heavy Piece	Price
4185A No. 12 Power	400	400	16x2½	1	6x3	2¼x3	18	19	19	185	235	32	$ 80.00
4185B No. 14 T & L Pulleys	400	400	16x2½	1	6x3	2¼x3	18	22	19	215	270	32	$ 90.00
TYPE WC													
4185C No. 16 Power	1500	400	20x3	2	9x4	2⅜x4	22	22	26	380	460	66	$145.00
4180D No. 18 T & L Pulleys	1500	400	20x3	2	9x4	2⅜x4	22	25	26	425	515	66	$160.00

BRAUN CHIPMUNK CRUSHERS

RENEWAL PARTS FOR CHIPMUNK CRUSHERS

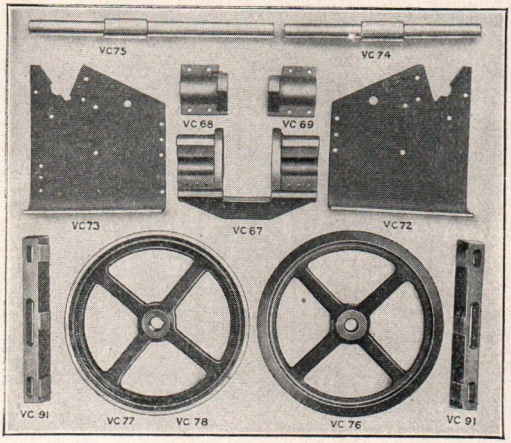
Small Size—Type VC, Nos. 12 and 14

No. 4186B



			Price
VC	60	Movable Jaw, complete with Cap, Bushing and Plate	$15.00
VC	61	Cap for Movable Jaw	$ 1.50
VC	62	Front Spacer Casting	$ 3.00
VC	63	Adjusting Block with Swivel Block VC 64	$ 2.00
VC	65	Toggle	$ .35
VC	66	Toggle Block	$ 1.00
VC	67	Bearing Casting with Caps	$20.00
VC	68	Right Hand Bearing Cap	$ 1.25
VC	69	Left Hand Bearing Cap	$ 1.25
VC	70	Bronze Bushing, Right Hand Bearing	$ 4.50
VC	70-A	Bronze Bushing, Left able Jaw	$ 6.00
		Hand Bearing	$ 4.50
VC	71	Bronze Bushing for Mov-	
VC	72	Right Hand Frame Plate	$ 6.00
VC	73	Left Hand Frame Plate	$ 6.00
VC	74	Shaft, Hand and Power	$ 6.00
VC	75	Shaft, for Tight and Loose Pulleys	$ 9.00
VC	76	Hand Wheel	$ 5.00
VC	77	Tight Pulley	$ 7.00
VC	78	Loose Pulley	$ 7.00
VC	79	Collar	$ .50
VC	80	Stationary Jaw, Complete	$ 5.00
VC	81	Frame Stud for Stationary Jaw	$ .75
VC	82	Plate for Statinary Jaw, 6⅝x3 in.	$ .50
VC	83	Handle for Stationary Jaw	$ .50
VC	84	Adjusting Screw	$ 3.00
VC	85	Cheek Plate, 8½x3 in.	$ .40
VC	86	Plate for Movable Jaw, 7¼x3 in.	$ .50
VC	87	Spring Rod	$ .20
VC	88	Spring	$ .20
VC	89	Ore Pan	$ .75
VC	90	Handle with Bolt	$ .25
VC	91	Mounting Blocks	$ 2.00
VC	92	Bolts and Washers for Mounting	$ .30

			Price
VC	93	Grease Cup	$ 1.00
VC	94	Oil Cup	$ .15
VC	95	Key for Shaft	$ .10
VC	96	**Cap** Screws for VC 66	$ .05
VC	97	Bolts for VC 67	$ .05
VC	98	Cap Screws for VC 62	$ .05
VC	99	Cap Screws for VC 85	$ .05
VC	100	Cap Screws for VC 80	$ .05
VC	101	Cap Screws for VC 68 and VC 69	$ .05
VC	102	Cap Screws for VC 60	$ .05
VC	103	Cap Screws for VC 61	$ .05
VC	104	Set Screws for VC 61	$ .05
VC	105	Set Screws for VC 68 and VC 69	$ .05

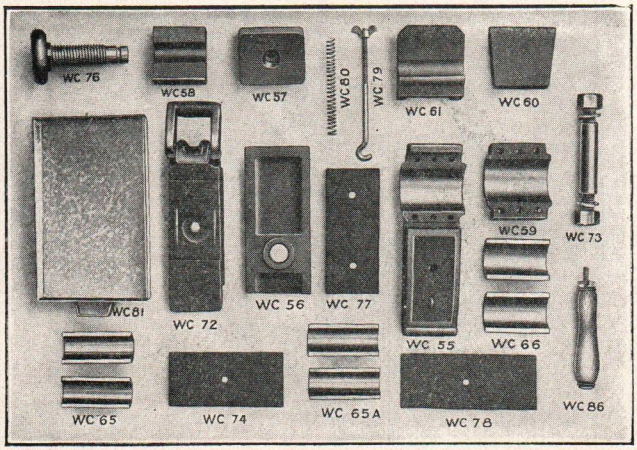


No. 4186A

BRAUN CHIPMUNK CRUSHERS

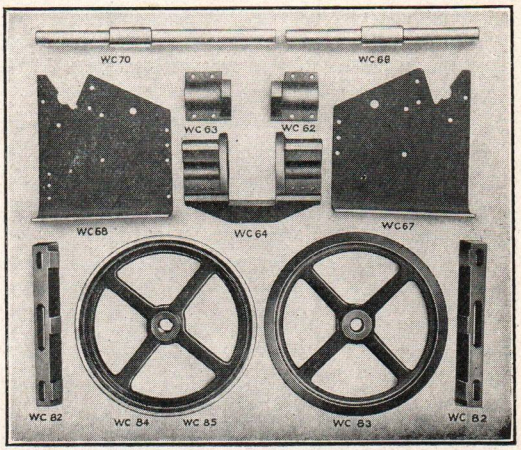
RENEWAL PARTS FOR CHIPMUNK CRUSHERS

Large Size—Type WC, Nos. 16 and 18



No. 4187B

WC 55 Movable Jaw, Complete with Cap, Bushing and Plate.
WC 56 Front Spacer Casting.
WC 57 Adjusting Block with Swivel Block WC 58.
WC 59 Cap for Movable Jaw.
WC 60 Toggle.
WC 61 Toggle Block.
WC 62 Left Hand Bearing Cup.
WC 63 Right Hand Bearing Cup.
WC 64 Bearing Casting with Caps.
WC 65 Bronze Bushing, Right Hand Bearing.
WC 65-A Bronze Bushing, Left Hand Bearing.
WC 66 Bronze Bushing for Movable Jaw.
WC 67 Right Hand Frame Plate.
WC 68 Left Hand Frame Plate.
WC 69 Shaft, Hand and Power.
WC 70 Shaft, Tight and Loose Pulleys.
WC 71 Collar.
WC 72 Stationary Jaw Complete.
WC 73 Frame Stud for Stationary Jaw.
WC 74 Plate for Stationary Jaw, 8⅝x4 inches.
WC 75 Handle for Stationary Jaw.
WC 76 Adjusting Screw.
WC 77 Cheek Plate, 10x4 inches.
WC 78 Plate for Movable Jaw, 10x4 in.
WC 79 Spring Rod.
WC 80 Spring.
WC 81 Ore Pan.
WC 82 Mounting Block.
WC 83 Hand Wheel.
WC 84 Tight Pulley.
WC 85 Loose Pulley.
WC 86 Handle with Bolt.
WC 87 Bolts and Washers for Mounting.
WC 88 Grease Cup.
WC 89 Oil Cup.
WC 90 Key for Shaft.
WC 91 Cap Screw for WC 61.
WC 92 Bolt for WC 64.
WC 93 Cap Screw for WC 56.
WC 94 Cap Screw for WC 77.
WC 95 Cap Screw for WC 72.
WC 96 Cap Screw for WC 62 and WC 63.
WC 97 Cap Screw for WC 55.
WC 98 Cap Screw for WC 59.
WC 99 Set Screw for WC 59.
WC 100 Set Screw for WC 62 and WC 63.

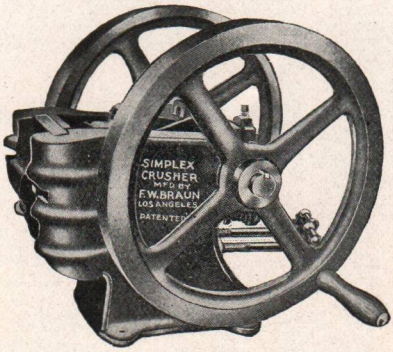


No. 4187A

BRAUN SIMPLEX CRUSHERS

An Ideal Laboratory Crusher—Hand or Power Driven

(Patented April 15, 1902)



No. 4188A

A cast iron crusher or rigid construction, particularly recommended for hand operation, though it can also be operated by belt power. (For power operation we recommend the steel frame Chipmunk Crushers.

Important features of this machine are: The ease with which it may be opened for cleaning, and the simplicity of its adjustment.

One blow of a hammer loosens the wedge holding the non-vibrating jaw in place, allowing this jaw to be lifted out, thereby giving sufficient access for cleaning.

BRAUN SIMPLEX CRUSHERS

The fineness of the product obtained is regulated by increasing or decreasing the size of the discharge or lower opening of the jaws; this can be accomplished by a few turns of two regulating screws, which have hand wheels, obviating the necessity for use of wrench or other tools.

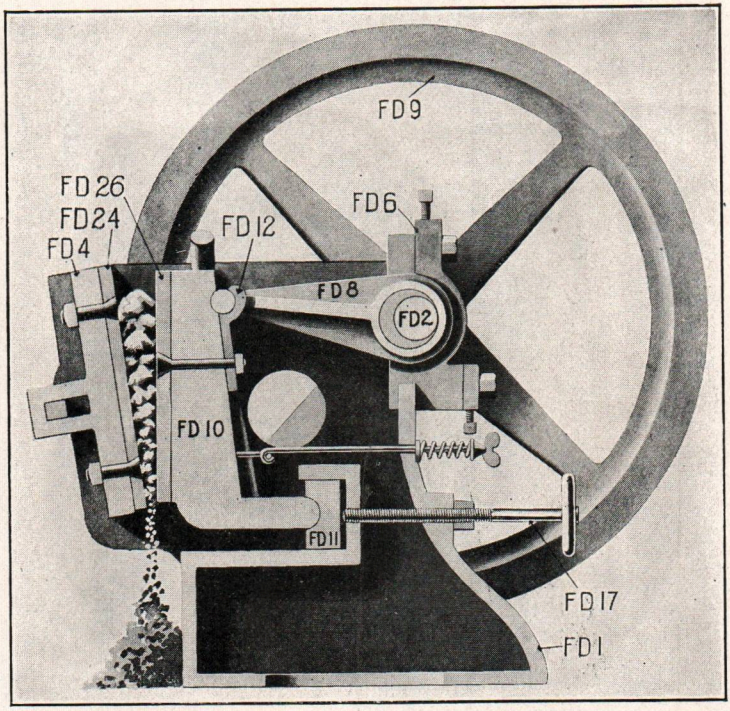
The frame is made of cast iron and the parts which bear the strain are all sufficiently strong for the purpose. The steel jaw plates are reversible and can easily be removed for renewal when necessary.

A motor of ½ H.P. is sufficient to operate this crusher. The best results are obtained if the machine is speeded to about 200 R.P.M.

Capacity, 100 lbs. per hour, to ¼ inch and smaller.

SIMPLEX CRUSHERS	Capacity Lbs. per Hr.	R. P. M.	Dimensions of Pulleys Inches	H. P.	Size of Jaws (in.)	Opening of Jaws (in.)	Dimensions Inches			Weights Pounds			PRICE
							Length	Width	Height	Net	Packed	Heav'st Piece	
4188A Hand	50	200	16x1½	—	6x3	2x3	20	12	18	154	190	49	$50.00
4188B Power	100	200	16x2½	½	6x3	2x3	19½	13	18	162	197	49	$54.00
4188C T & L pulleys	100	200	16x2½	½	6x3	2x3	19½	15½	18	195	245	49	$60.00

BRAUN SIMPLEX CRUSHERS



No. 4189A

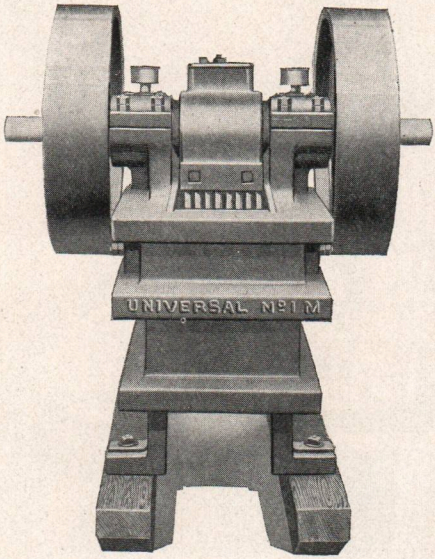
Sectional View

RENEWAL PARTS FOR SIMPLEX CRUSHERS

		Price
FD 1	Frame	$20.00
FD 2	Shaft, for hand or power	$ 6.00
FD 3	Shaft, for Tight and Loose Pulleys	$ 9.00
FD 4	Stationary Jaw	$ 2.50
FD 5	Handle, with Bolt	$ .25
FD 6	Cap, with Lug	$ 3.00
FD 7	Cap, without Lug	$ 2.00
FD 8	Pitman	$ 3.00
FD 9	Hand Wheel	$ 5.00
FD 10	Vibratory Jaw	$ 2.50
FD 11	Brass Bearing Box	$ 1.50
FD 12	Clamp for Pitman	$ .50
FD 13	Key for Wheel	$ .25
FD 14	Fibre wsher between Tight and Loose Pulleys	$ .50
FD 15	Wedge for Stationary Jaw	$ .50
FD 16	Shim for Brass Bearing Box	$ .25
FD 17	Short Adjusting Screw	$ 1.50
FD 18	Long Adjusting Screw	$ 1.50
FD 19	Rod for Spring	$ .50
FD 20	Coil Spring	$ .75
FD 21	Large Cup Washer for Spring	$ .25
FD 22	Small Cup Washer for Spring	$ .25
FD 23	Thumb Nut for FD 19	$ .25
FD 24	Plate for Stationary Jaw	$ .50
FD 25	Bolt for above	$ .15
FD 26	Plate for Vibratory Jaw	$ .50
FD 27	Bolt for above	$ .15
FD 28	Cheek Plates	$ .50
FD 29	Bolts for above	$ .15
FD 30	Long Cap Screw for FD 6	$ .35
FD 31	Short Cap Screw for FD 6, 7	$ .35
FD 32	Tight Power Wheel	$ 7.00
FD 33	Loose Power Wheel	$ 7.00

Prices are net F. O. B. Denver, Los Angeles, El Paso and Salt Lake City. Agents for Braun Laboratory Appliances.

UNIVERSAL CRUSHERS

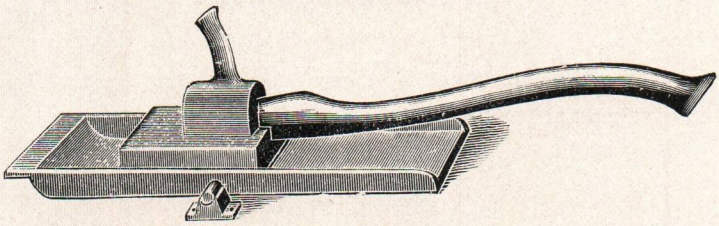


No. 4190A

Approximate Capacity in Tons 10 Hour Day, Based on Ordinary Limestone

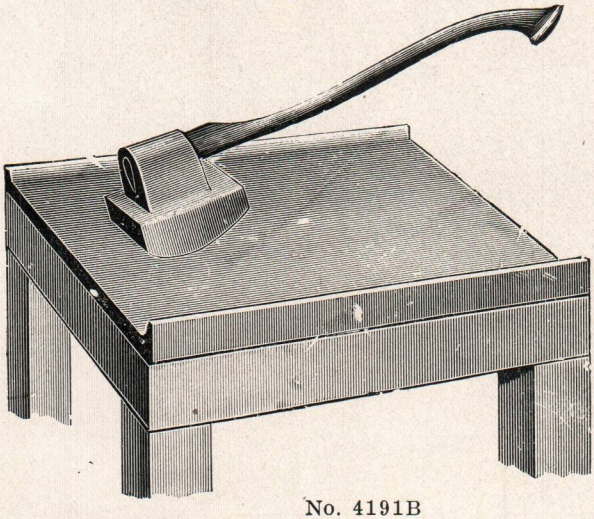
UNIVERSAL LINE	Jaw Open Corr.	H. P.	Approx. Weight	2½″	1½″	1″	3″	¼″ and Finer
No. 1	4x 6	2 to 3	550		5 to 7	4 to 5	3 to 4	2 to 3
No. 1-M	5x 6	3 to 4	1100		8 to 10	5 to 7	4 to 6	3 to 4
No. 2	8x 8	5 to 8	2500	20 to 30	16 to 20	12 to 15	10 to 12	5 to 8
No. 2-M	8x12	7 to 10	3200	35 to 50	25 to 35	20 to 25	15 to 20	8 to 12
No. 3	9x14	10 to 12	4650	50 to 70	40 to 50	25 to 35	20 to 30	10 to 14
No. 3-M	9x16	12 to 15	5500	80 to 100	50 to 60	40 to 50	30 to 40	12 to 16
No. 4	10x16	15 to 20	9000	100 to 125	60 to 70	50 to 60	40 to 50	
No. 4-M	11x18	20 to 25	12500	125 to 175	80 to 100	60 to 75	50 to 60	
No. 5	14x20	25 to 30	15000	200 to 250	150 to 175	100 to 125	60 to 80	
No. 5-M	14x24	30 to 35	16500	250 to 300	175 to 200	125 to 150	80 to 100	

CRUSHERS

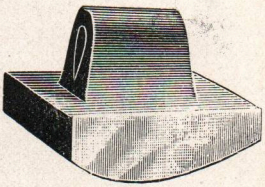


No. 4191A

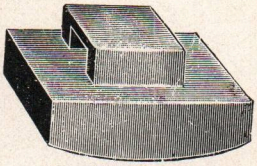
4191A **BUCKING BOARD AND MULLER.** On trunnions, smooth castings. Size 7x28 inches, weight of plate, 37 pounds, Muller 36 pounds, complete $15.00



No. 4191B



No. 4191C



No. 4191D

4191B **BUCKING BOARD AND MULLER...** For quickly reducing ore to a fine powder, of iron 1 inch thick, planed smooth on grinding side, and having flange on two sides 1½ inches high. Supplied with either round or flat faced muller.

Size .....inches	12x18	18x20	20x24	24x30	24x36	30x36
Weight .pounds	15	15	20	25	25	35
Price.....each	$12.00	18.00	20.00	27.00	33.00	38.00

Note. Round mullers which take regular axe handle, are always supplied (except the 35-lb. muller with the 30x36-inch which is flat); flat mullers take pick handles.

4191C **CRUSHERS, EXTRA MULLERS.** Small, medium and large, with best hickory handles, per pound $0.25

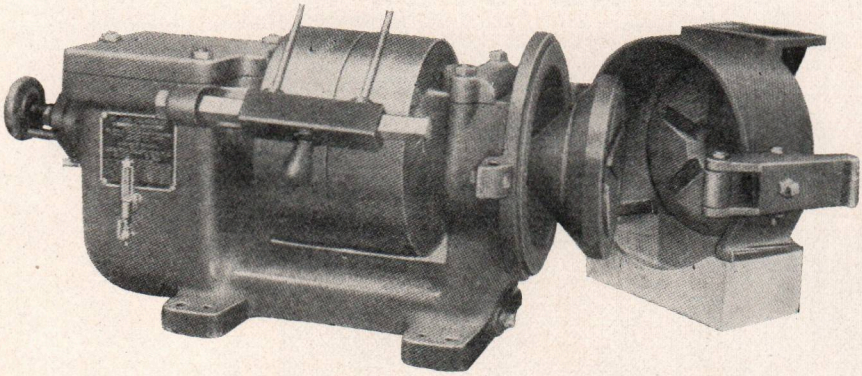
4191D **CRUSHERS,** of hardest chrome steel. Plates are 18x24 inches and weigh about 115 pounds each. Rubbers are 8x7 inches, and weigh about 30 pounds each. Both the face of the plate and the face of the rubber are machined. "Does not grind off into the sample," Used by the U. S. Steel Corporation for crushing iron ore and recommended by the Chemist's Committee in their "Uniform Methods."

Plate and Rubber ..... Price on application.

McCOOL PULVERIZERS

The Mine and Smelter Supply Company, Sole Agents
(Patents Pending on Machine, Its Discs and Parts)

MODEL 9½-K



No. 4192A

PRICE

Complete machine		$198.50
Extra discs, per set (state type)		10.50
Diameter of discs	9½	inches
Face of pulleys	4	inches
Diameter of pulleys	12	inches
Pulley speed recommended	275	r. p. m.
Horsepower	2	h. p.
Shipping weight	570	pounds
Length over all	40	inches
Height over all	17	inches
Width over all	18	inches

Prices subject to change without notice.

McCOOL PULVERIZERS

Until recent years the use of a bucking board for grinding ore samples for assaying was quite a universal custom. It was, at best, a slow and laborious process, not in keeping with modern practice, which demanded a more rapid and efficient method. Various machines were devised for this purpose, the foremost among them being the disc type of grinder, many styles of which have made their appearance.

A combination of experience with earlier models with a thorough knowledge of the requirements most desired in a machine of this character led to the development of the 9½ K McCool Pulverizer. This machine is the outgrowth of a demand in the Cripple Creek District, Colorado, where the exacting nature of the work required of a sample grinder called for the best that could be procured. It is especially adaptable for all manner of fine grinding, of almost any article either wet or dry, pulverizing either soft or hard materials, to any desired mesh of fineness, at one operation.

It is unequalled as a pulverizer for laboratory, assay, sampling or other fine grinding purposes. It is economical. Compact floor space, 1 foot 8 inches by 3 feet 4 inches. Clean and practically noiseless. We guarantee it the peer of all grinders under the most exacting conditions.

We have been crowned with 10 years of success and are fully protected by a bulwark of United States and foreign patents. We are in the field to stay and respectfully solicit your patronage.

GRINDING

The grinding is done between two discs—one stationary, the other having a double rotation, which gives a rubbing motion, reducing the ore quickly and preventing grooving of the discs, which remain smooth and serviceable until worn out.

MECHANISM

The mechanism is not complicated, being only the application of mechanically true movements to a machine for a special purpose. The main shaft, upon which the driving pulley is mounted. is hollow, while the disc driving shaft is located eccentrically within it. A train of four gears is arranged to rotate the movable disc and at the same time give an eccentric motion to the shaft carrying it, giving the rotary disc a double rotation. These gears run in oil noiselessly, and in a closed chamber.

McCOOL PULVERIZERS

GRINDING DISCS

The discs may be changed in less than two minutes, and are the only wearing parts necessary to replace. Their cost being low, the cost of repairs is insignificant. They are made of a composition determined after very careful experimenting to give the greatest durability consistent with rapid grinding. The rotating disc is attached to its shaft by an utomatically, adjustable clutch in such a manner that it is free to adjust itself to the plane of the stationary disc, and the annoying period which occurs on other machines while the discs are wearing to a fit for proper grinding is avoided. This is accomplished by a ball-and-socket joint, which takes the thrust of the grinding. The stationary disc will naturally wear more rapidly on the power part, but, on account of this automatic adjustment, the discs are always in proper grinding contact. Provision is also made for changing stationary disc to any one of six positions.

GRINDING ADJUSTMENT

The adjustment for fineness may be made when the machine is running by simply turning a hand wheel which automatically locks in position.

CLEANING AND REMOVAL

The removal of and cleaning after each ground sample is easily and quickly accomplished, as the machine is opened or closed by one operation, being held closed by a patented adjustable automatic self-locking device. The sample pan is attached to the front case, which is hinged, and anything adhering to the case or stationary disc can be brushed into the pan. The rotating disc and grinding chamber are entirely exposed for cleaning. The surface of the grinding chamber is machined smooth. It is dust-tight, and operators report no loss of value through dust, nor is there danger of salting.

CAPACITY

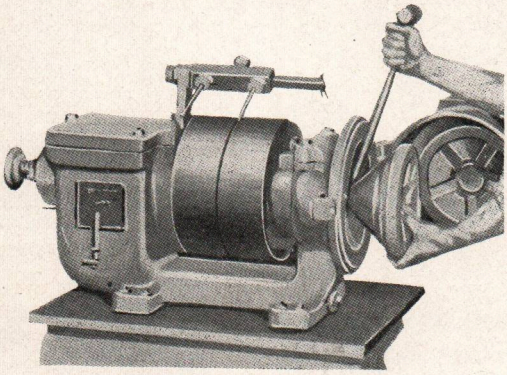
The capacity of the 9½K McCool Pulverizer is especially large. The large size will reduce a one-pound sample to 100 mesh in thirty seconds. The capacity, of course, is dependent largely upon the character of the ore, the size and the mesh of the feed, and the desired mesh of the product.

McCOOL PULVERIZERS

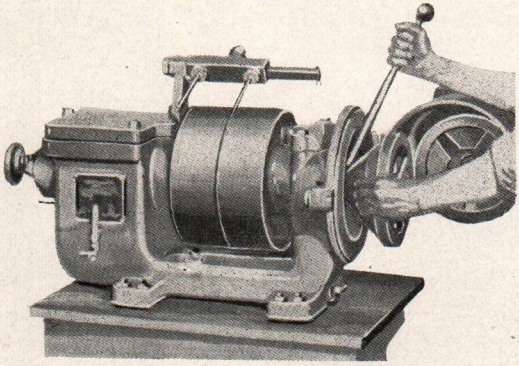
CAUTION

Use good grade of light engine oil. If cheap, gummy or heavy oils are used the oil ports will clog. This would necessitate taking entire machine apart and giving a thorough cleaning.

CHANGING DISCS



No. 4195A

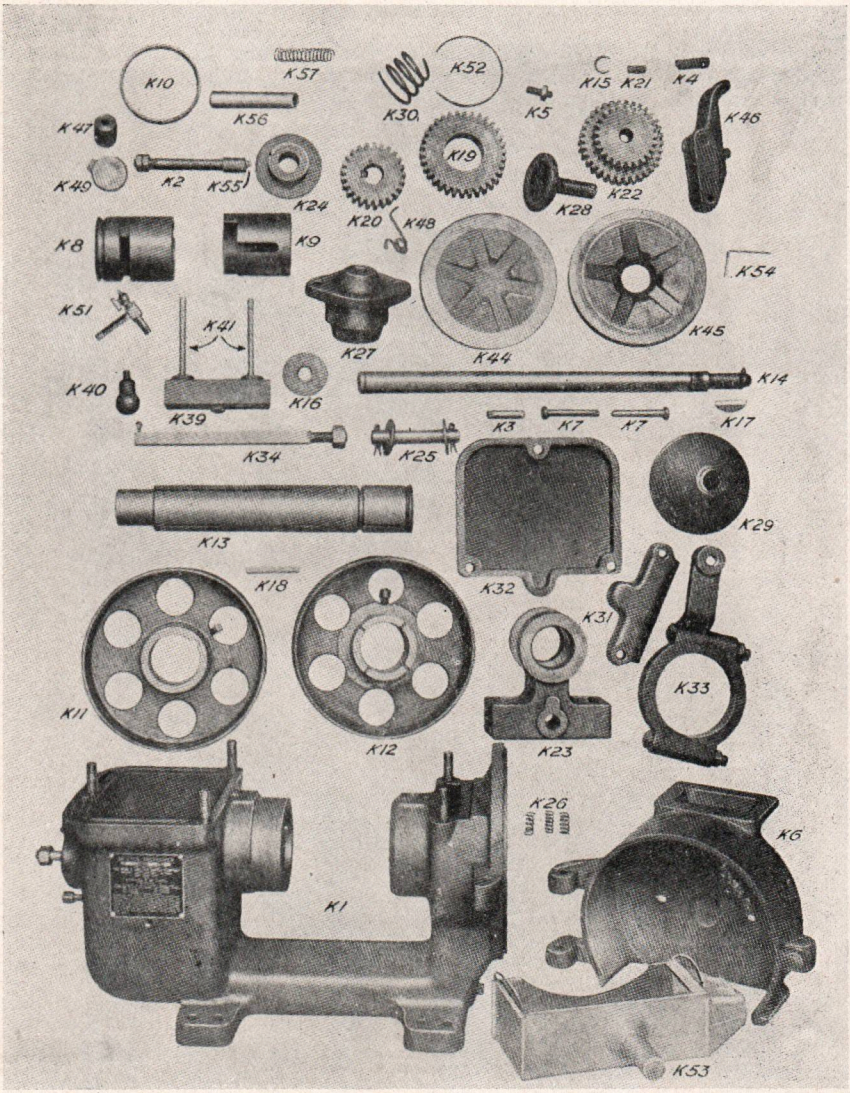


No. 4195B

To change Rotary Disc; slide Disc Driver forward ½ inch (this may be accomplished by using a short lever not over 12 or 14 inches long; see illustration). This will allow the disc to turn on the cone. Turn the disc ¼ turn either to right or left. The disc can then be removed. To put on a new disc, slide the disc driver forward in the same manner. Place disc on cone and turn ¼ of a turn either to right or left and allow clutch to slide into place. This allows the lugs on back of disc to engage in recesses in the disc driver|

To change Stationary Disc remove the two hexagon nuts on front of grinding chamber.

McCOOL PULVERIZERS
REPAIR PARTS



No. 4196A
ORDERING REPAIR PARTS

IMPORTANT—In ordering repair parts be sure to give the number and name of part required according to repair parts list, also give serial number, size and style of machine given on name plate.

When ordering discs, state type of discs used (see types of discs on page 11), the kind and size of material to be pulverized as well as the fineness or mesh desired of the finished product. Caution: In no case should this machine run over 300 R. P. M.

McCOOL PULVERIZERS

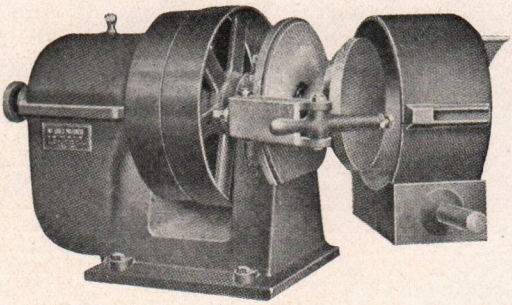
No. 4197A

REPAIR PARTS LIST—SIZE 9½K McCOOL PULVERIZER

9½K 1	Frame	$50.00
9½K 2	Hinge Point	2.50
9½K 3	Front Bearing Pin	.75
9½K 4	Rear Bearing Pin	.40
9½K 5	Hopper Lock Adjusting Screw	.80
9½K 6	Hopper	14.00
9½K 7	Hopper Lock Pins (2 Pins), each	.75
9½K 8	Front Bearing Shell	7.00
9½K 9	Rear Bearing Shell	5.50
9½K10	Oil Ring	1.50
9½K11	Tight Pulley	9.00
9½K12	Loose Pulley	9.00
9½K13	Eccentric Shaft	20.00
9½K14	Disc Shaft	8.50
9½K15	Stop Spring for Disc Shaft	.30
9½K16	Disc Shaft Washer	.30
9½K17	Disc Driver Key	.35
9½K18	Tight Pulley Key	.50
9½K19	Eccentric Shaft Gear	12.00
9½K20	Disc Shaft Gear	10.50
9½K21	Eccentric Shaft Gear Key	.25
9½K22	Differential Gear	18.00
9½K23	Gear Hanger	12.50
9½K24	Gear Hanger Bushing	2.50
9½K25	Gear Hanger Pin	1.50
9½K26	Gear Hanger Springs (3 Springs), each	.10
9½K27	Thrust-bearing Gland	5.00
9½K28	Rear Adjusting Handle	3.00
9½K29	Disc Driver	11.00
9½K30	Disc Driver Spring	.90
9½K31	Front Bearing Cover	1.50
9½K32	Gear Case Cover	4.00
9½K33	Belt Shifter Support	6.00
9½K34	Belt Shifter Bridge	2.00
9½K39	Belt Shifter Body	2.00
9½K40	Belt Shifter Handle	.75
9½K41	Belt Shifter Pins	.50
9½K44	Rotary Disc	5.50
9½K45	Stationary Disc	5.00
9½K46	Hopper Lock Handle	2.25
9½K47	Lock Handle Roller	.60
9½K48	Lock Handle Spring	.40
9½K49	Thrust Button	2.50
9½K50	Adjusting Handle Spring	2.00
9½K51	Oil Gauge	1.50
9½K52	Dust Packing Ring for Front Bearing	.20
9½K53	Sample Pan	5.00
9½K54	Hinge Pin Lock Spring	.40
9½K55	Hinge Pin Oil Cup	.60

McCOOL PULVERIZERS

SMALL SIZE



No. 4198A

PRICE

		Small Size
4198A	Complete Machine	$110.00
4198B	Extra Discs, per set (state type)	6.60

Diameter of discs	6	inches
Face of pulleys	11	inches
Diameter of pulleys	11	inches
Pulley speed recommended	250	r. p. m.
Horsepower	1	h. p.
Shipping weight	330	pounds
Length over all	30	inches
Height over all	14½	inches
Width over all	11	inches

PRICE LIST McCOOL PULVERIZER

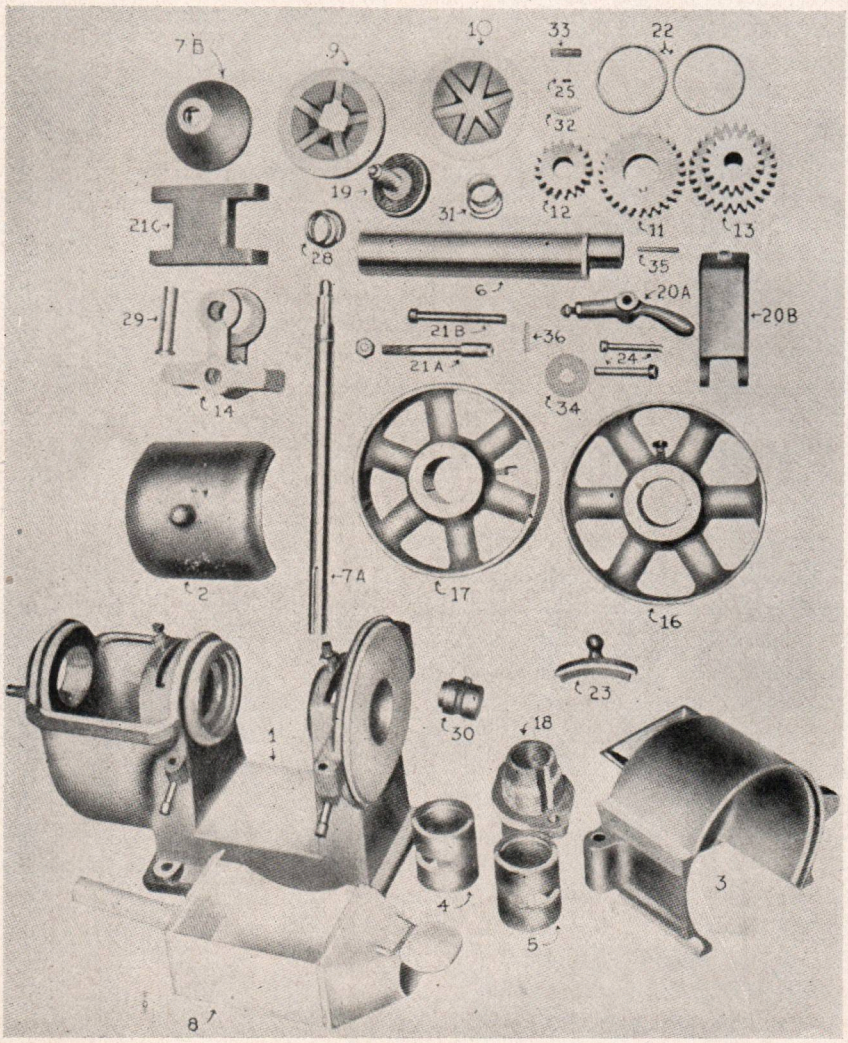
No. 4199A

REPAIR PARTS

		6 ½ Inches Small Size
1	Frame	$36.00
2	Gear Cover	2.40
3	Hopper and Grinding Chamber	10.20
4	Front Bearing	3.60
5	Rear Bearing	3.60
6	Eccentric Shaft	13.20
7a	Disc Shaft	7.80
7b	Disc Driver	7.20
8	Sample Pan	4.35
9	Stationary Disc	3.05
10	Rotary Disc	3.55
11	*Eccentric Shaft Gear, cast iron	7.20
12	*Disc Shaft Gear, cast iron	6.00
13	*Double Transmission Gear, cast iron	12.60
14	Gear Hanger	6.00
16	Driving Pulley	6.60
17	Loose Pulley	6.60
18	Locking Thrust Bearing	2.40
19	Adjusting Screw	2.40
20a	Hopper Lock Handle	1.20
20b	Hopper Handle Hinge	2.40
21a	Front Hopper Hinge Pin	1.50
21b	Rear Hopper Hinge Pin	1.00
21c	Hopper Hinge	2.40
22	Oil Rings	.90
23	Oil Well Cover	.60
24	Hopper Lock Pin	.75
25	Safety Screw for Disc Shaft	.12
28	Disc Clutch Spring	.60
29	Gear Hanger Pin	.90
30	Thrust Button	1.80
31	Hopper Hinge Spring	.30
32	Eccentric Shaft Key	.30

*Steel Gears can be supplied if desired. Prices on application.

REPAIR PARTS

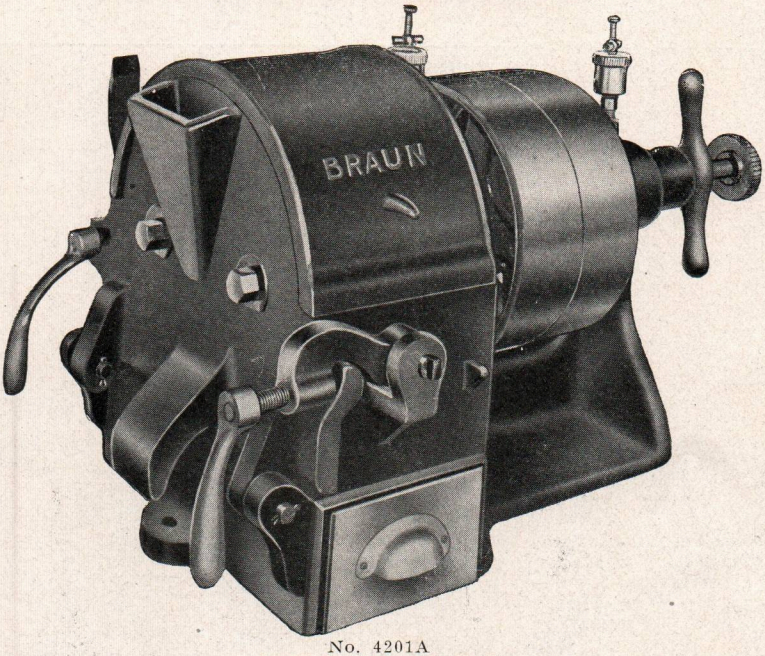


No. 4200A

33	Stationary Disc Stud	$ .18
34	Disc Clutch Washer	.12
35	Ratchet Pawl	.18
36	Ratchet Pawl Spring	.12

In ordering repairs, be sure to give the number of the piece wanted, as shown on previous page; also the number and style of machine repair is for. In ordering discs, give character of material you are pulverizing.

THE BRAUN PULVERIZER



No. 4201A
(Patented May 18, 1909)

BRAUN TYPE UA PULVERIZER

The Braun Type UA Pulverizer has a world-wide reputation and is universally recognized as the standard laboratory pulverizer. While particularly adapted for metallurgical samples, it is also rendering excellent service in industrial laboratories. The machine has a straight drive without gears, is economical in upkeep expense, and will pulverize as efficiently as the more complicated models.

OPERATION—The machine is fed through the spout in the door and will take material ¼ mesh and smaller (which product may be obtained from the Chipmunk Laboratory Crushers), and reduce it all with one grinding to any desired mesh. Quickly adjusted for any fineness by means of the adjusting screw. Permanent adjustment for any desired mesh can be maintained by tightening the lock lever. The adjustment is not altered when opening the machine for cleaning.

PLATES—The new design grinding plates are made of a special alloy combining strength and toughness, thus assuring wearing quality; and their special design with large and small lugs secures the highest efficiency.

CLEANING—The machine opens in a way so that the operator can always see that all pulp is brushed into the pan. The entire interior of the machine is smooth finished, with all parts accessible for rapid and thorough cleaning with a brush.

SIMPLICITY—With ordinary care and the keeping of the grease cups properly filled, the machine will last indefinitely. The only parts to replace are the grinding plates, and these will handle from 2,500 to 7,500 (according to kind) usual ore samples for each set of plates.

CAPACITY—Quartz ore previously crushed to one-quarter inch the machine has a record of.

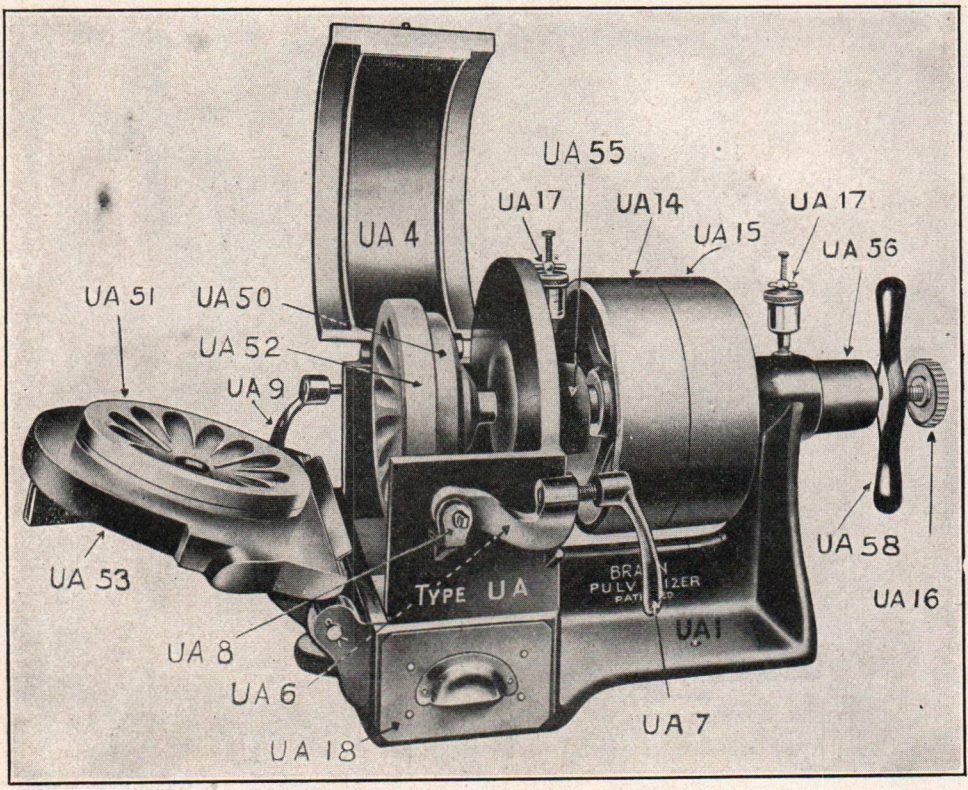
DIMENSIONS

Length	Width	Height	Speed	Pulleys	Power
23 ins.	14 ins.	14½ ins.	850 R. P. M.	9x9½ ins.	1 H. P.

The Type UA Pulverizer is furnished complete with one set of grinding plates. Renewal plates are also listed.

	Pulverizer Type UA	Grinding Plates Per Set
Weight net, lbs.	235	19
Weight packed, lbs.	275	20
Price	$125.00	$8.00

THE BRAUN PULVERIZER

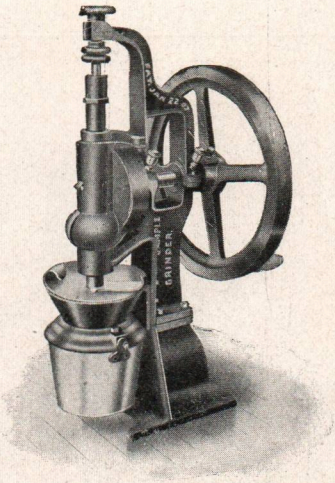


No. 4202A

RENEWAL PARTS FOR BRAUN TYPE UA PULVERIZER

		Price
UA 1	Frame	$55.00
UA 3	Hinge Pin for Door	.15
UA 4	**Cover**	4.25
UA 5	Hinge Pin for Cover	.15
UA 6	Drop Clutch	.65
UA 7	Hand Screw for Clutch	.75
UA 8	Screw for Clutch	.25
UA 9	Eye Bolt with Hand Nut	.75
UA 10	Pin for Eye Bolt	.15
UA 12	Cap Screw for Stationary Plate	.15
UA 14	Tight Pulley, 9x2½ in.	4.00
UA 15	Loose Pulley, 9x2½ in.	4.00
UA 16	Hand Adjusting Screw	.75
UA 17	Grease Cup	1.00
UA 18	Ore Pan	1.00
UA 20	Collar with Set Screws	.75
UA 21	Steel Washer	.10
UA 24	Brush	.60
UA 49	Masterpiece	3.00
UA 50	Flange with Shaft	6.00
UA 51	Stationary Plate	4.00
UA 52	Revolving Plate	4.00
UA 53	Door	20.00
UA 54	Cap Screws for Revolving Plate	.20
UA 55	Babbitted Bushing for Front Bearing	3.50
UA 56	Babbitted Bushing for Rear Bearing	4.00
UA 57	Malleable Bracket for Supporting Cover	1.00
UA 58	Lock Lever	.75
UA 59	Set Screw for Front Bearing UA 55	.45
UA 60	Set Screw for Rear Bearing UA 56	.45
UA 62	Cap Screw for Bracket UA 57	.15
UA 63	Washer for Cap Screw for Stationary Plate	.10
UA 64	Lag Screws	.05
UA 66	Wrench	.25
UA 65	"S" Wrench	.25

BRAUN SAMPLE GRINDER



(Patented January 22, 1907)

No. 4203A. Type 6R.

The **BRAUN HAND SAMPLE GRINDER,** Type 6R, is a thoroughly practical hand power grinder for pulverizing rock.

It will pulverize a 4-ounce sample of hard quartz rock to 60 mesh in 2 minutes, to 80 mesh in 2½ minutes, to 100 mesh in 3 minutes.

Like all our machines, this Grinder has been designed to meet laboratory requirements. The adjustment may be altered instantly. Permanent adjustment for any desired mesh can be maintained by setting the two lock nuts in the proper position. Only the nut at the top of the adjusting screw is released to lower the revolving plate for thorough cleaning. The ease with which this machine can be cleaned will readily appeal to the operator.

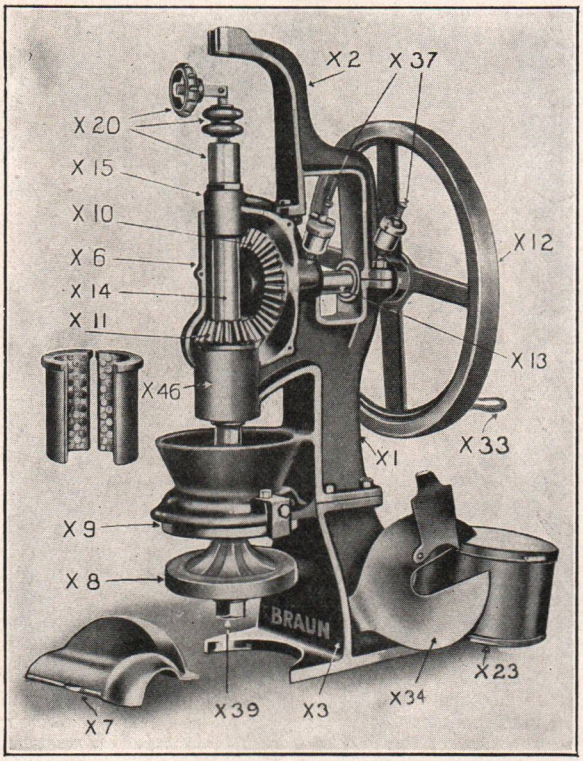
It is dust proof, and there is no loss of material. The gears are nclosed, obviating all danger. The vertical shaft runs in special oil-less bearings, and there is little or no friction. The bucket is suspended from two screws and fits closely, making an absolutely tight receptacle which insures the discharge of material into the pan.

DIMENSIONS—Height, 31 in.; width, 21 in.; hand wheel, 16x2 in.; grinding plates, diam., 6 in.

The Type 6R **BRAUN SAMPLE GRINDER,** for rock, is furnished with one set of grinding plates. Renewal plates are also listed.

	Grinder Type 6R	Grinding Plates per set
Weight net, pounds	125	11
Weight packed, pounds	180	12
Price	$75.00	$8.00

BRAUN SAMPLE GRINDER

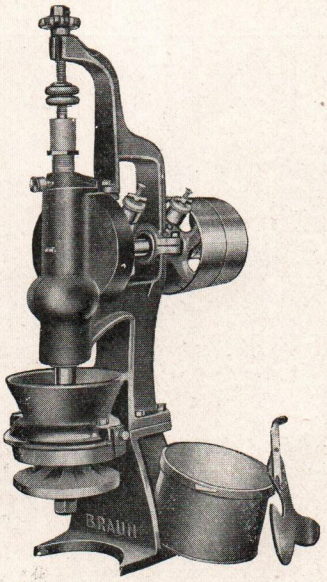


No. 4204A

RENEWAL PARTS

X 1	Gear Frame with Hopper	$20.00
X 2	Top Brace	1.50
X 3	Table Bracket	4.00
X 6	Gear Shield, Left	1.00
X 7	Gear Shield, Right	1.00
X 8	Revolving Plate	4.00
X 9	Stationary Plate	4.00
X 10	Gear	3.00
X 11	Pinion	3.00
X 12	Hand Wheel, 16x2 in.	5.00
X 13	Horizontal Shaft	1.00
X 14	Vertical Shaft	7.00
X 15	Nut for Vertical Shaft	.35
X 20	Adjustment Attachment complete, including Ball Bearing Collar, Steel Balls, Adjusting Screw, Adjusting Nut and Lock Nut	6.00
X 23	Ore Pan	1.50
X 24	Cap Screw for Stationary Plate	.10
X 25	Cap Screw for Hopper	.10
X 26	Cap Screw for Frame	.10
X 27	Bottom Cap Screw for Brace	.10
X 28	Top Cap Screw for Brace	.10
X 29	Cap Screw for Bucket	.10
X 30	Screw for Gear Shield	.02
X 32	Pin to Hold Pan	.05
X 33	Wood Handle with Bolt	.25
X 34	Cover for Hopper	1.50
X 35	Brush	.60
X 36	Lag Screw	.05
X 37	Grease Cup	1.00
X 39	Hexagon Nut for Shaft	.25
X 46	Sleeve in Lower Vertical Bearing	6.00

BRAUN IRON ORE GRINDER



No. 4205A

(Patented Jan. 22, 1907)

TYPE 6-S FOR IRON ORE

The Type 6-S Iron Ore Grinder is more lightly constructed than the Type 7 Braun Iron Ore Grinder described on the opposite page and is designed for intermittent use in laboratories where continued operation is not necessary.

The grinding plates are six inches in diameter and are made of special carbon steel with low phosphorous content. They are mounted vertically, permitting operation with a minimum of friction on the grinding surfaces.

The Grinder is equipped with machine-cut gears, permitting its operation at high speed, and tight and loose pulleys.

The adjustment may be altered instantly. Permanent adjustment can be maintained by setting the two lock nuts at the proper place on the adjusting screw. Only the hand nut at the top of the adjusting screw is released when it is desired to lower the revolving plate for cleaning the grinder.

It will pulverize one pound to 100 mesh in two minutes.

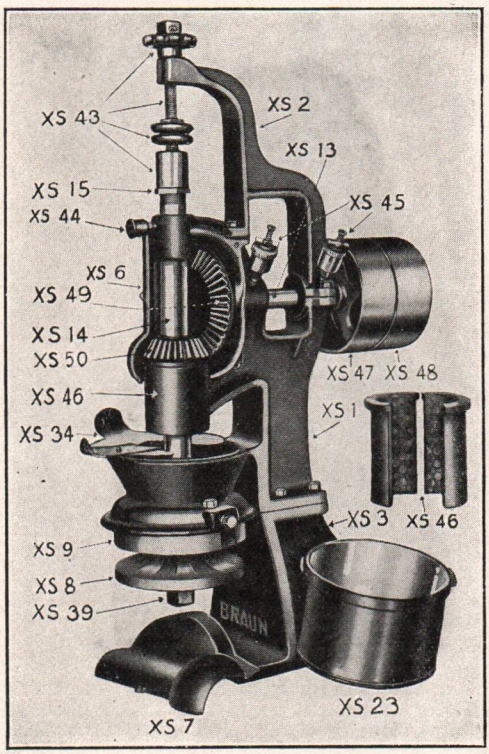
Speed recommended, 500 R.P.M., the grinding plates revolving 80 R.P.M. Motor required, 1 H. P.

DIMENSIONS—Height, 31 ins.; width, 24 ins.; pulleys, 6x2 ins.; grinding plates, diam., 6 ins.

Type 6-S Iron Ore Grinder is furnished with one set of grinding plates. Renewal plates are also listed.

	Grinder Type 6-S	Grinding Plates Per Set
Weight net, pounds	135	11
Weight packed, pounds	190	12
Price	$100.00	$20.00

BRAUN ORE GRINDER

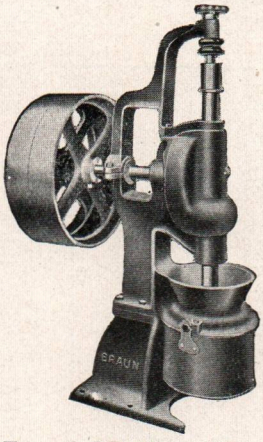


No. 4206A

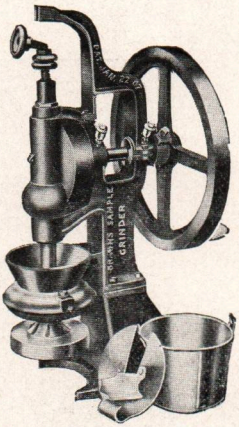
RENEWAL PARTS FOR IRON ORE GRINDER, TYPE 6-S

XS 1	**Gear** Frame with Hopper	$20.00
XS 2	Top Brace	1.50
XS 3	Table Bracket	4.00
XS 6	Gear Shield, Left	1.00
XS 7	Gear Shield, Right	1.00
XS 8	Revolving Plate, Carbon Steel	10.00
XS 9	Stationary Plate, Carbon Steel	10.00
XS 13	Horizontal Shaft	1.00
XS 14	Vertical Shaft	7.00
XS 15	Nut for Vertical Shaft	.35
XS 23	Ore Pan	1.50
XS 24	Cap Screw for Stationary Plate	.10
XS 25	Cap Screw for Hopper	.10
XS 26	Cap Screw for Frame	.10
XS 27	Bottom Cap Screw for Brace	.10
XS 28	Top Cap Screw for Brace	.10
XS 29	Cap Screw for Bucket	.10
XS 30	Screw for Gear Shield	.02
XS 32	Pin to Hold Pan	.05
XS 34	Cover for Hopper	1.50
XS 35	Brush	.60
XS 36	Lag Screw	.05
XS 39	Hexagon Nut for Shaft	.25
XS 43	Adjustment Attachment complete, including Ball Bearing Collar, Steel Balls, Straight one-piece Adjusting Screw, Adjusting Nut and Lock Nut	6.00
XS 44	Plain Grease Cups	.40
XS 45	Automatic Grease Cups	1.00
XS 46	Sleeve in Lower Vertical Bearing	.....
XS 47	Tight Pulley, 6x2 in.	3.00
XS 48	Loose Pulley, 6x2 in.	3.00
XS 49	Gear	8.00
XS 50	Pinion	9.00
XS 51	Safety Collar	.50

BRAUN COAL GRINDER



Type 6 CP, No. 4207A



Type 6C, No. 4207B

TYPES 6C AND 6CP FOR COAL

(Patented January 22, 1907)

The Braun Coal Grinder is a thoroughly practical machine fitted with specially designed grinding plates for grinding coal and coke samples.

The construction is dust-proof, and there is no loss of material. The gears are enclosed, obviating all danger. The vertical shaft runs in special bearings, and there is little or no friction. The bucket is suspended from two screws and fits closely, makng an absolutely tight receptacle which insures the discharge of material into the pan. The adjustment may be altered instantly.

If desired the adjustment may be set permanently for grinding to any particular degree of fineness by setting the two lock nuts on the adjusting screw at the proper point. When the machine is to be cleaned only the nut at top of adjusting screw is released to lower the revolving plate.

CLEANING—The ease with which this machine can be cleaned will readily appeal to the operator. The revolving plate is lowered and all portions are readily accessible for thorough cleaning.

This machine is specially adapted for grinding coal and coke samples. Such prominent users as the laboratory of A. D. Little of Boston, the Fairmount Coal Co. of Fairmount, West Virginia, and the Coal Testing Laboratories of the U. S. Government are using our machines and consider them indispensable.

The following average results have been obtained:

Coal 2 lbs. to 20 mesh in 1 minute.
2 ozs. to 80 mesh in 5 minutes.
Coke 2 lbs. to 20 mesh in 6 minutes.
2 ozs. to 80 mesh in 7 minutes.

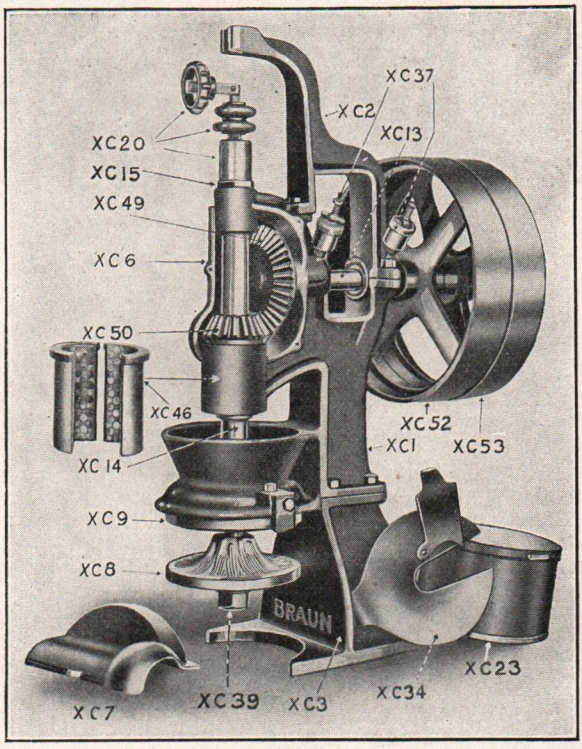
Two types of machines are furnished for this purpose, one for hand power and the other fitted with tight and loose pulleys to be operated by belt. When operated by power it should not be speeded over 200 R. P. M. A ½ H. P. motor is sufficient for operating the machine.

DIMENSIONS—Width, 21 inches; height, 31 inches; hand wheel No. 6C, 16x2 inches; pulleys No. 6CP, 12x2 inches; grinding plates, diam., 6 inches.

Coal Grinders Types 6C and 6CP are furnished with one set of grinding plates. Renewal plates are also listed.

	Grinder Type 6C Hand Power	Grinder Type 6CP T. & L. Pulleys	Grinding Plates Per Set
Weight, net, pounds	125	135	11
Weight, packed, pounds	180	190	12
Price	$85.00	$90.00	$8.00

BRAUN COAL GRINDER



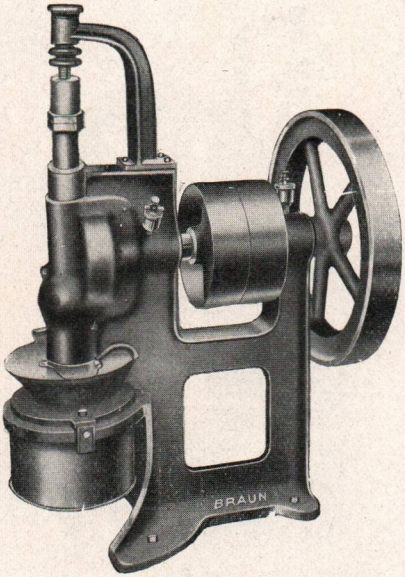
No. 4208A

RENEWAL PARTS FOR COAL GRINDERS

Types 6C and 6CP

XC 1	Gear Frame with Hopper	$20.00
XC 2	Top Brace	1.50
XC 3	Table Bracket	4.00
XC 6	Gear Shield, Left	1.00
XC 7	Gear Shield, Right	1.00
XC 8	Revolving Plate	4.00
XC 9	Stationary Plate	4.00
XC 13	Horizontal Shaft	1.00
XC 14	Vertical Shaft	7.00
XC 15	Nut for Vertical Sh[illegible]	[illegible]
XC 20	Adjustment Attachment complete, including Ball Bearing Collar, Steel Balls, Adjusting Screw, Adjusting Nut and Lock Nut	6.00
XC 23	Ore Pan	1.50
XC 24	Cap Screw for Stationary Plate	.10
XC 25	Cap Screw for Hopper	.10
XC 26	Cap Screw for Frame	.10
XC 27	Bottom Cap Screw for Brace	$ .10
XC 28	Top Cap Screw for Brace	.10
XC 29	Cap Screw for Bucket	.10
XC 30	Screw for Gear Shield	.02
XC 32	Pin to Hold Pan	.05
XC 33	Wood Handle with Bolt	.25
XC 34	Cover for Hopper	1.50
XC 35	Brush	.60
XC 36	Lag Screw	.05
XC 37	Grease Cup	1.00
XC 39	Hexagon Nut for Shaft	.25
XC 42	Drive Wheel, 16x2 in.	7.00
XC 46	Sleeve in Lower Vertical Bearing	6.00
XC 49	Gear	8.00
XC 50	Pinion	9.00
XC 52	Tight Pulley, 12x2 in.	5.00
XC 53	Loose Pulley, 12x2 in.	5.00

BRAUN ORE GRINDER



No. 4209A

TYPE 7 FOR IRON ORE

A Grinder Designed for Heavy Duty

A machine built especially for GRINDING IRON ORE SAMPLES. CARBON STEEL GRINDING PLATES seven inches in diameter, with LOW PHOSPHOROUS CONTENT, are mounted vertically. This construction permits of grinding very hard material with a minimum of friction on the grinding surfaces—reducing wear, and saving in power cost.

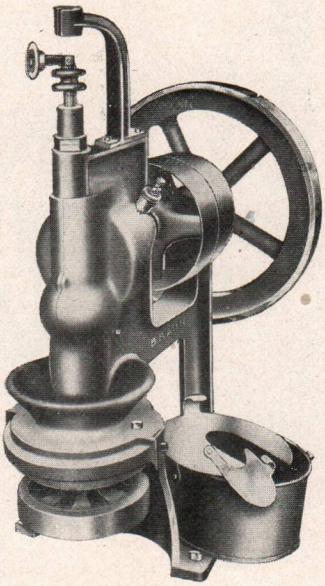
The substantial frame permits OPERATION at HIGH SPEED, an ESSENTIAL FACTOR in the GRINDING of IRON ORE.

The two vertical berings are of special type, which prevents oil and grease coming in contact with the sample. It has MACHINE CUT GEARS to insure light running with a minimum of noise. The gears are enclosed to obviate danger. Equipped with a heavy balance wheel and tight and loose pulleys.

Designed to meet laboratory requirements, it can be thoroughly and quickly cleaned.

The adjustment may be set permanently for any desired mesh or may be altered instantly. For a permanent adjustment the two lock nuts on the adjusting screw are set at the proper point. Only the hand nut at the top of adjusting screw is released in order to lower the revolving plate for cleaning the machine.

BRAUN ORE GRINDER



No. 4210A

CAPACITY

The pulverizer will take material ¼ inch and smaller and reduce it to any degree of fineness with one operation.

It will pulverize one lb. to 100 mesh in one and one-half minutes.

Speed of pulley, 600 R.P.M. Grinding plates revolving 960 R.P.M. Motor required, 1 H.P.

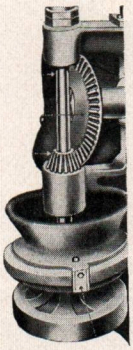
DIMENSIONS

Length	Width	Height	Plates, Diam.	Pulleys
24 in.	16 in.	31 in.	7 in.	7½x2¼ in.

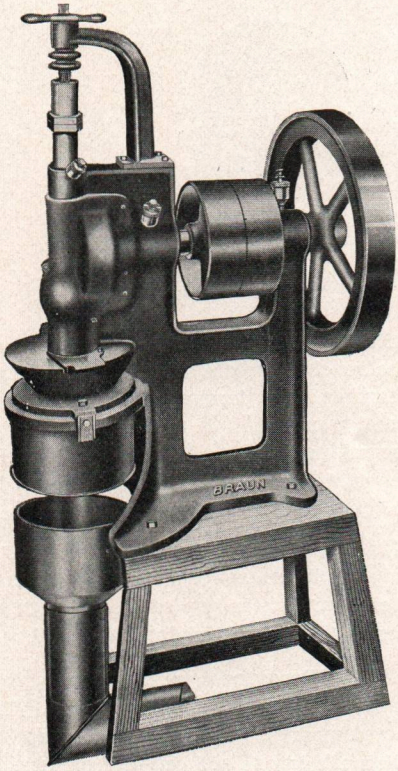
4210A **BRAUN IRON ORE LABORATORY GRINDER** is furnished with one set of grinder plates. Renewal plates are also listed. Type 7.

	Grinder Type 7	Grinding Plates Per Set
Weight net, lbs.	210	17
Weight packed, lbs.	290	18
Price	$125.00	$22.50

BRAUN CEMENT GRINDER



View Showing Gears and Grinding Plates



No. 4211B

No. 4211A

(Patented Jan. 22, 1907)

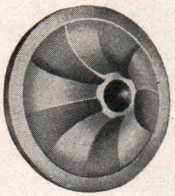
TYPE 7A

4211A **BRAUN LABORATORY GRINDER** is built especially for grinding Cement laboratory samples, including Cement Rock, Clinker and Lime Rock. It can also be used to good advantage in metallurgical and industrial laboratories where the elimination of floating dust in the grinding room is desirable. Type 7A.

The grinding Plates, seven inches in diameter are Mounted Vertically. This construction permits of grinding the hardest material with a minimum of friction on the grinding surfaces—reducing wear, and saving in power cost. The grinding plates are made of a special alloy combining strength and toughness, thus assuring wearing quality.

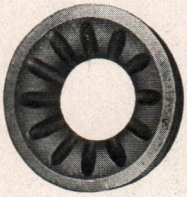
The substantial frame and machine cut gears permit operation at high speed, an essential factor in grinding hard material and reducing time and labor costs.

BRAUN LABORATORY GRINDER



Revolving Plate

No. 4212A



Stationary Plate

No. 4212B

CLEANING—With the sample bucket removed and the discharge pipe in place, the revolving plate is slightly lowered and the air blast turned into the grinding chamber, thus forcing all of the remaining particles into the discharge pipe, whence by suction it is drawn into suitable receivers. Because of the fact that the ground material is delivered uniformly around the grinding plate there is no danger of the enrichment of any sample due to aspiration as the cleaning of the machine does not take place until after the sample bucket has been removed.

The adjustment may be altered instantly. Permanent adjustment for any desired mesh can be maintained by setting the two lock nuts at the desired point. Only the lock lever at the top of the adjustment screw is released when the revolving plate is to be lowered for claning the machine

CAPACITY—The grinder will take material ¼ inch and smaller and reduce it to any degree of fineness in one operation. The adjustment is very simple and can be changed when the machine is in operation or at rest. It will pulverize one pound to 100 mesh in one and one-half minutes.

DIMENSIONS

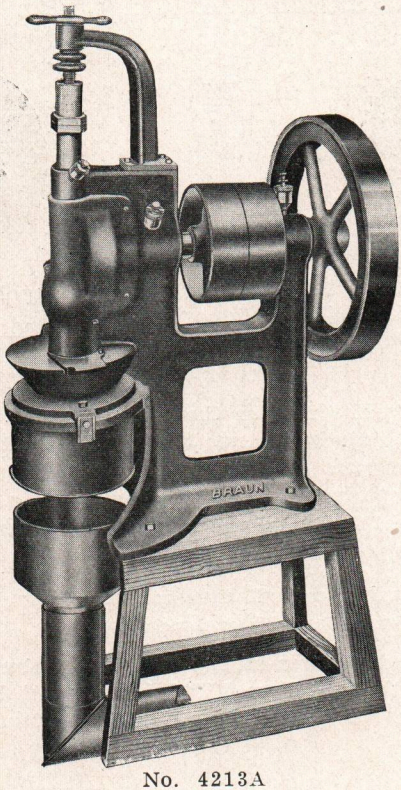
Length	24 in.	Grinding plates, diam.	7 in.
Width	16 in.	Pulleys	7½x2¼ in.

Speed: Pulley, 600 R.P.M. Grinding plates, 960 R.P.M. Motor required, 1 H.P.

4212A **LABORATORY GRINDER** for dustless pulverizing of cement and other materials is furnished with one set of grinding plates and funnel-shaped discharge pipe, (but without wood stand). Renewal Plates and Wood Stand are also listed. Type 7A.

	Grinder Type 7A	Grinding Plates per set	Wood Stand extra
Weight, net, lbs.	210	17	25
Weight, packed, lbs.	260	18	40
Price	$125.00	8.00	8.00

BRAUN COAL GRINDER



No. 4213A

TYPE 7C

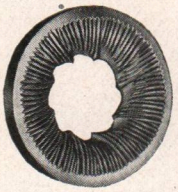
A Large Grinder for Coal and Coke Samples

The **BRAUN COAL GRINDER,** Type 7C, is a machine built especially for pulverizing coal and coke samples where the service demands are heavy and continuous.

The Grinding Plates, seven inches in diameter, are mounted vertically. This construction permits of grinding the material with a minimum of friction on the grinding surfaces, reducing wear and saving in power cost. The grinding plates are made of a special alloy combining strength and toughness, assuring long wearing quality. The special design of the grinding plate surface is the result of many painstaking experiments and overcomes the natural tendency of coal to stick in and clog the ordinary form of grinding plates.

CLEANING—With the sample bucket removed and the discharge pipe in place, the revolving plate is slightly lowered and the air blast turned into the grinding chamber, thus forcing all of the remaining particles into the discharge pipe, whence by suction it is drawn into suitable receivers. Because of the fact that the ground material is delivered uniformly around the grinding plate there is no danger of the enrichment of any sample due to aspiration as the cleaning of the machine does not take place until after the sample bucket has been removed.

BRAUN COAL GRINDER



Stationary Plate

No. 4214A

Revolving Plate

No. 4214B

The adjustment is like that on the other grinders. It may be set permanently for grinding to any desired mesh or it may be altered instantly as conditions require. For a permanent setting the two lock nuts on the adjusting screw are set at the proper point. When the revolving plate is lawered for cleaning only the lock lever at the top of adjusting screw is released.

CAPACITY—The pulverizer will take material ¼ inch and smaller and reluce it to any degree of fineness with one operation.

This machine having seven-inch plates, will pulverize samples in proportionately less time than the Type 6CP Grinder, which has six-inch plates.

Speed of pulley 200 R.P.M. Grinding Plates revolving 320 R.P.M. Motor required 1 H.P.

DIMENSIONS

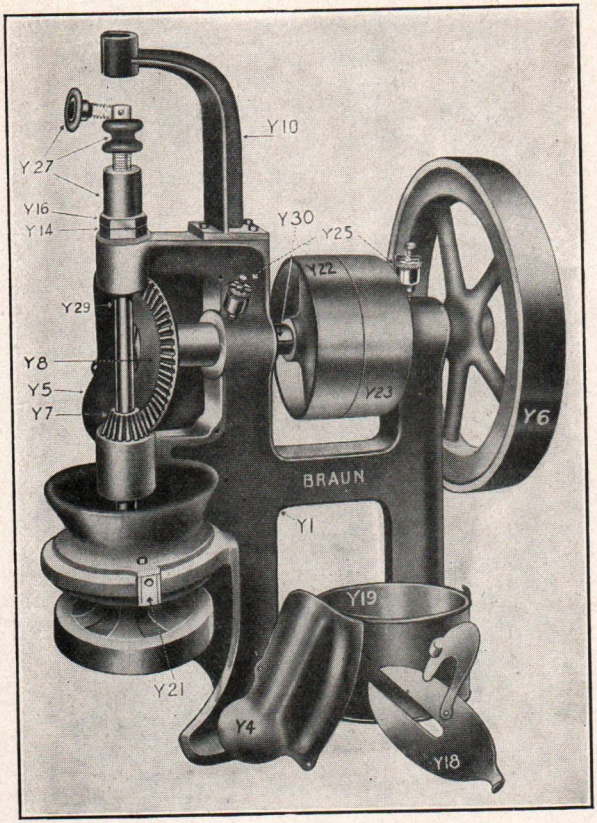
Length	24 in.	Grinding Plates, diam.	7 in.
Width	16 in.	Pulleys	7½x2¼ in.
Height	31 in.		

Type 7C BRAUN COAL LABORATORY GRINDER is furnished with one set of plates and special funnel-shaped discharge pipe. Renewal plates are also listed

	Coal Grinder Type 7C	Grinding Plates Per Set	Wood Stand Extra
Weight, net, lbs.	210	17	25
Weight, packed, lbs.	290	18	40
Price	$125.00	8.00	8.00

RENEWAL PARTS FOR GRINDERS

TYPE 7 IRON ORE, TYPE 7A CEMENT, TYPE 7C COAL



No. 4215A

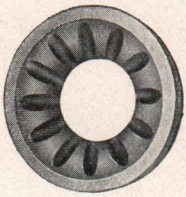
Type		Price
Y 1	Frame	$50.00
Y 2	Stationary Plate, Carbon Steel	11.25
Y 3	Revolving Plate, Carbon Steel	11.25
Y 4	Gear Shield, Right	1.00
Y 5	Gear Shield, Left	1.00
Y 6	Fly Wheel	12.00
Y 7	Pinion	9.00
Y 8	Gear	9.00
Y 9	Bushing for Lower Vertical Bearing	6.00
Y 10	Top Brace	3.00

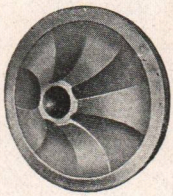
Type		Price
Y 14	Cap for Vertical Shaft	$ 1.50
Y 16	Jam Nut for Y27	.50
Y 17	Bushing for Top Vertical Bearing	4.00
Y 18	Cover	1.50
Y 19	Pan	3.00
Y 21	Lugs on Frame for Holding Pan	.25
Y 22	Tight Pulley, 8x2 in.	4.00
Y 23	Loose Pulley, 8x2 in.	4.00
Y 24	Lag Screws	.05
Y 25	Grease Cups	1.00
Y 26	Cap Screws	.05

RENEWAL PARTS FOR GRINDERS

TYPE 7, IRON ORE, TYPE 7A CEMENT, TYPE 7C COAL

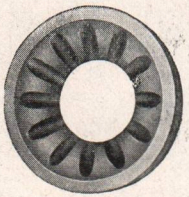
GRINDING PLATES

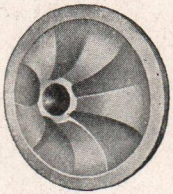




Y2 **For Iron Ore** **Y3**

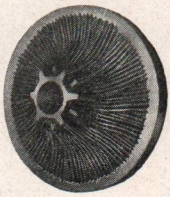
No. 4216A





YA37 **For Cement** **YA38**

No. 4216B



YC39 **For Coal** **YC40**

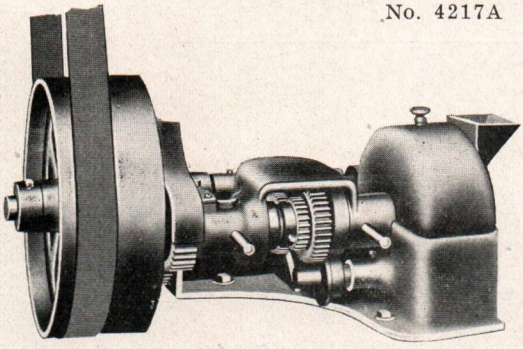
No. 4216C

Type		Price
Y 27	Adjustment Attachment complete, including Ball Bearing Collar, Steel Balls, Adjusting Screw, Adjusting Nut and Lock Nut	$7.00
Y 29	Vertical Shaft	7.00
Y 30	Horizontal Shaft	3.00
Y 31	Key for Pinion	1.50
Y 32	Pin for Gear	.10
Y 34	Latch to Hold Pan	2.00
Y 35	Special Exhaust Hopper for dustless cleaning	5.00
YA 37	Stationary Plate, Semi-Steel	4.00
YA 38	Revolving Plate, Semi-Steel	4.00
YC 39	Stationary Plate, Tough Iron	4.00
YC 40	Revolving Plate, Tough Iron	4.00

PULVERIZERS

ADVANCE DISC SAMPLE GRINDER

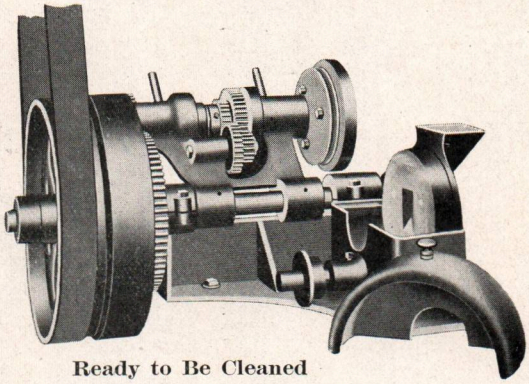
No. 4217A



Ready for Work

These machines are intended for the use of assayers who realize the importance of a properly ground sample.

The Advance Disc Sample Grinder consists of a main frame or support to which is secured a stationary disc. A rocker-arm, carrying a driven shaft, to one end of which is secured a grinding disc, and having driving gears at the opposite end, is pivotally journaled to the main frame of the machine. When in operation, the disc on the driven shaft is given a double motion, rotating and vibrating. The oscillating or vibrating motion is created by means of an eccentric on the driven shaft, which by rotating against a roller, which is journaled to the main frame of the machine, causes the rocker-arm carrying the driven disc shaft to rise and fall.



Ready to Be Cleaned

The cam or eccentric is not keyed to the disc shaft, but is slowly rotated around the disc shaft by means of gears so as to limit the oscillating motion of the ricker arm and disc to a contracted orbit of travel. This double motion is very destructive to the ore particles, which are fed between the discs from a hopper leading to an opening through the stationary disc, and not only alters the position of the rolling particles between the discs, but prevents the discs from becoming concentrically grooved, which would occur should the disc or discs have a rotary motion only.

The rocker-arm carrying the driven shaft and disc may be lifted or swung over, clear of the opposing disc, to allow both discs to be cleaned of any adhering particles of any sample previously crushed, which might otherwise "salt" the succeeding sample.

4217A **ADVANCE DISC SAMPLE GRINDER.** Power size, like illustration. Diameter of discs, 9 inches; tight and loose pulleys. Weight, 375 pounds. Requires 1½ H. P.

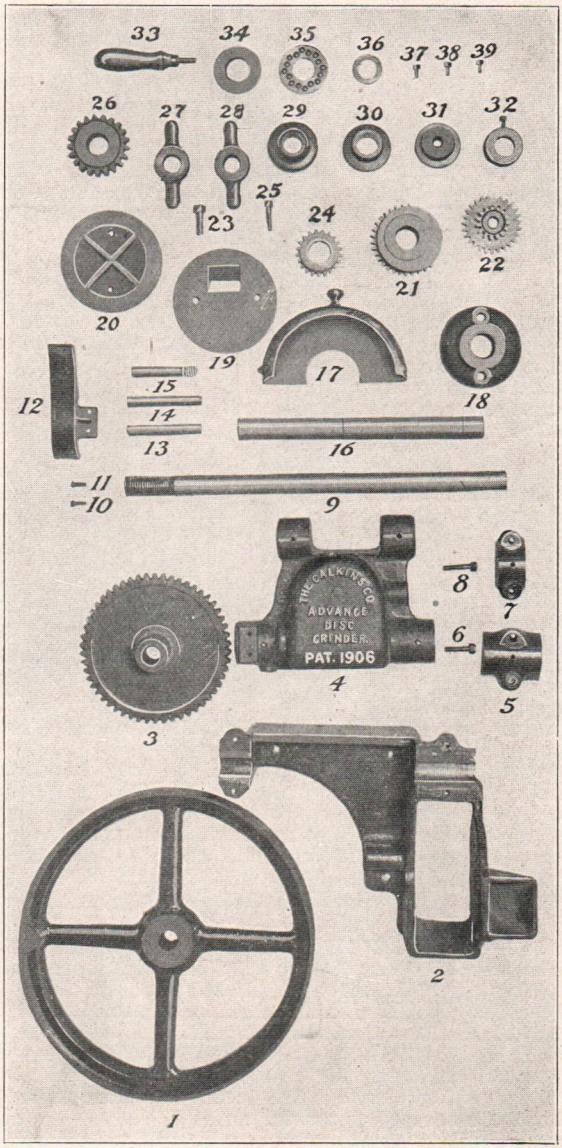
Price, Type 4116 ..... $150.00
Price, Extra Discs ..... each $5.00

4217B **ADVANCE DISC SAMPLE GRINDER.** To be operated by hand power, identical in design with above. The flywheel has a turned and crowned face to take a 2½-inch belt where it is desired to operate the machine by power.

The hand machine will pulverize a 20-ounce sample to 100 mesh in one minute. Diameter of discs, 6 inches; weight, 175 pounds. Type 4111.

Price, Type 4111 ..... $75.00
Price, Fitted with tight and loose pulleys $85.00
Price, Extra Discs ..... each, $ 4.00

ADVANCE DISC SAMPLE GRINDERS



No. 4218A

Repair parts for Advance Disc Grinders. For prices, see following page.

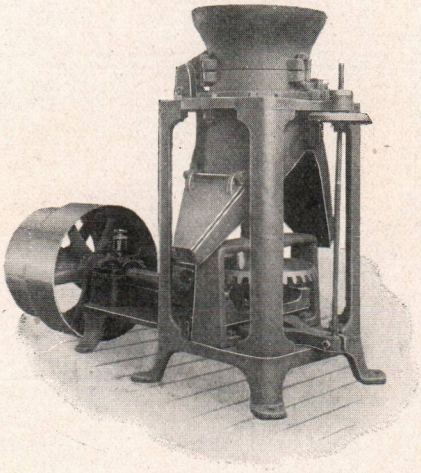
ADVANCE DISC SAMPLE GRINDERS

No. 4219A

REPAIR PARTS—PRICE LIST

No.		Hand Grinder 6-inch Discs	Power Grinder 9-inch Discs
1.	Hand Wheel	$ 7.50	$ .....
2.	Main Frame	15.00	30.00
3.	Large Outside Gear	6.00	12.00
4.	Upper Part of Frame or Rocker Arm	15.00	30.00
5.	Shaft Box Cap	1.50	2.25
6.	Cap Screws for No. 5	.15	.15
7.	Shaft Box Cap	1.25	1.50
8.	Cap Screws for No. 7	.15	.15
9.	Pivot Shaft	4.50	6.00
10.	Screw for No. 12	.10	.10
11.	Screw for No. 12	.10	.10
12.	Shield for Outside Gears, Nos. 3 and 26	.75	1.50
13.	Pin for No. 31	.40	.60
14.	Pin upon which Gear No. 22 runs	.40	.75
15.	Handle for Lifting Rocker Arm, each	.75	.75
16.	Driver Shaft	5.25	7.50
17.	Cover for Discs	2.25	3.25
18.	Iron Plate which fits on Driven Shaft and holds Rotary Disc	2.25	3 00
19.	Stationary Disc	2.25	5.25
20.	Rotary Dics	2.25	5.25
21.	Large Inside Gear with attached cam	6.00	9.00
22.	Inside Lower Double Gear	6.00	9.00
23.	Cap Screws for No. 19	.15	.25
24.	Small Inside Single Upper Gear	3.00	4.50
25.	Small Cap Screws for No. 20, each	.15	25
26.	Small Outside Gear	3.75	6.00
27.	Inside Lock Nut	.75	1.50
28.	Outside Lock Nut	.75	1.50
29.	Collar which fits outside of Hand Wheel on Pivot Shaft	.75	1.50
30.	Iron Collar which fits on one side of Ball Bearings	.75	1.25
31.	Roller which runs against Eccentric Cam	2.25	4.50
32.	Collar with set screw which fits inside of Gear No. 3 on Pivot Shaft	.75	1.25
33.	Handle	.75	.....
34.	Iron Washer which fits on one side of Ball Bearings	.40	.60
35.	Ball Bearings on Driven Shaft	3.75	4.50
36.	Ring against which Lock Nut 27 works	.75	.40
37.	Set Screw for No. 29	.10	.15
38.	Set Screw for No. 24	.10	.15
39.	Set Screw for No. 14	.10	.15
A.	Tight Pulley	.....	11.25
B.	Loose Pulley	.....	11.25
C.	Ball Bearings on Pivot Shaft	.....	4.50
D.	Washer for Ball Bearing No. C, outside	.....	.75
E.	Washer for Ball Bearing No. C, outside	.....	.60
F.	Bronze Bushings on Rocker Arm, each	3.75	7.50

IMPROVED ORE-SAMPLE GRINDERS



No. 4220A

4220A These machines are designed for the purpose of simplifying and economizing the grinding of ore samples. Grinder No. 2 is simple in construction, compact and extremely durable, and is extensively used by the leading smelters and sampling works. The hopper and grinding ring may be swung open and the cone lifted out and cleaned after the sample has been ground, and when the grinding ring and cone are worn they may be replaced by new ones without difficulty. The grinding parts are made of a hard compostion metal and are very durable.

Grinder No. 1 is a lighter machine than No. 2 and about one-half the capacity. It is suitable for mills and sampling works of moderate capacity.

The design varies somewhat from the No. 2 machine.

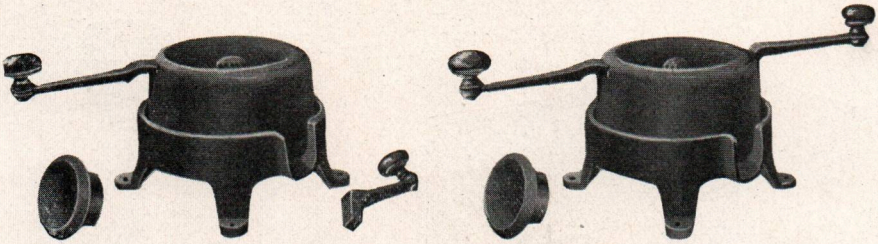
Type	Revolutions Driving Shaft per Minute	Diameter of Pulleys Inches	Face of Pulleys Inches	Weight Pounds	Price
1	200	24	5	550	.....
2	150	18	6	850	.....

PRICE LIST GRINDER PARTS

Article	Grinder No. 1 Weight	Grinder No. 1 Price	Grinder No. 2 Weight	Grinder No. 2 Price
Cone and Ring	80	.....	145	.....
Bevel Gear and Pinion	35	.....	50	.....
Vertical Shaft	20	.....	25	.....
Hand Wheel	8	.....	8	.....

Prices on application.

CRUSHERS



No. 4221A

WEATHERHEAD'S CRUSHER PULVERIZERS

4221A It is easy to clean, as there are no joints or corners for pulverized material to stick in.

It revolves easier when pulverizing material than it does when empty.

It is the only hand machine that discharges the material as soon as pulverized.

The working surfaces are tempered as hard as steel can be tempered, thereby minimizing the wear.

The machine has been in constant use for over twelve years, so that the claims for it have been thoroughly demonstrated.

The cover of the machine is made so it can be used for a small hand mortar, the ends of the handles being rounded to form a pestle.

Price $30.00

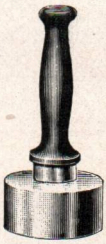
CUPEL MACHINES

4221B **CUPEL MOULDS,** Brass. Finely finished.

Dia.	1	1⅛	1¼	1½	1¾	2
Each	$4.00	4.50	5.00	6.00	6.50	8.00

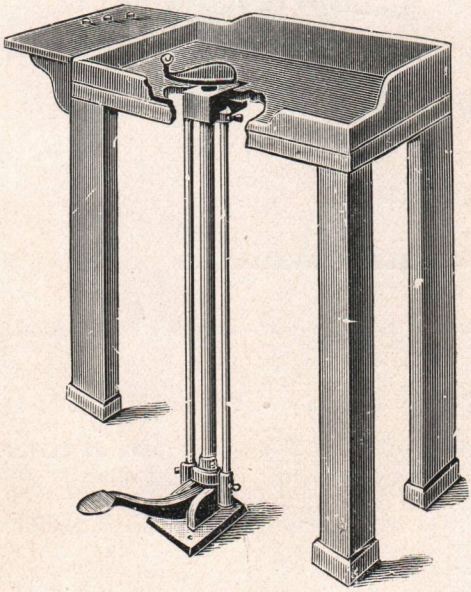
4221C **CUPEL MOULDS,** Iron.

Dia.	1	1⅛	1¼	1½	1¾	2
Each	$2.00	2.50	3.00	3.50	4.00	4.50

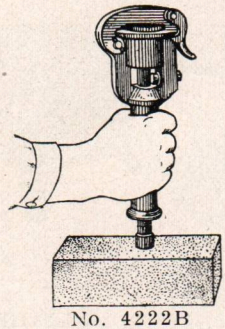


No. 4221B

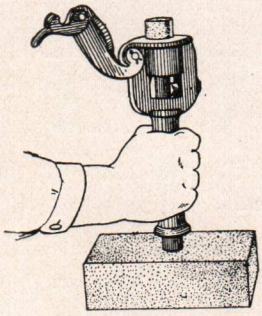
CUPEL MACHINES



No. 4222A



No. 4222B



No. 4222B

4222A **MACHINE—ILER'S PEDAL.** The most efficient and satisfactory machine made; having a capacity of 500 cupels per hour. It is made in two sizes, the ordinary size making 1¼ and 1½-inch cupels; the large size making 1¼, 1½, 1¾ and 2-inch. The changing of the dies to make any of the above sizes is extremely simple and takes less than a minute; all dies of brass.

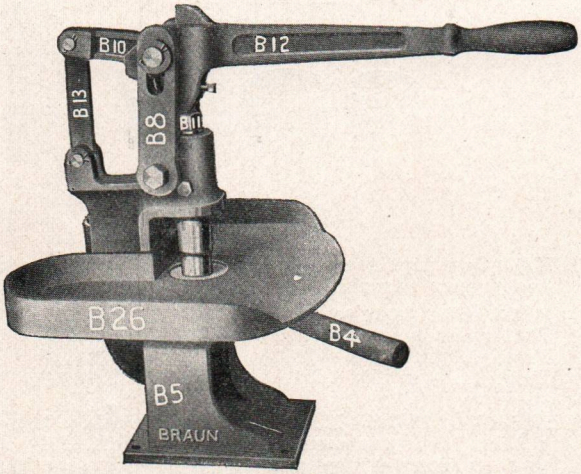
Price of machine complete to make 1¼ and 1½-inch cupels.....$35.00

Price of machine complete to make 1¼, 1½, 1¾ and 2-inch cupels—— 55.00

4222B **SIMPLEX CUPEL MOULD.** Simple, effective, cheap. A self-contained impact implement for the rapid manufacture of first-class cupels. No hammer or mallet required. Adjustable for making cupels of greater or less depth of bone ash. Made in two sizes: 1¼ inches and 1½ inches diameter. Weight, 5¾ pounds.

Price, net $7.50

BRAUN CUPEL MACHINE



No. 4223A

TABLE PATTERN

4223A This Cupel Machine produces perfect cupels, is simple in construction and easily operated. Hand driven cupels are never uniform either in size or compression, and a large percentage fissure or check in the muffle. The compressing power in this machine is obtained by a series of levers which multiply the applied power about twenty times. The pressure is steady, and by adjusting, different degrees of compression are obtainable. This overcomes the difficulty found in making cupels of same absorptive powers of different grades of bone ash, and permits the assayer to make cupels of any density he desires. Perfect edges and smooth faces are obtained by expelling cupel downward.

This machine is made with interchangeable molds and dies, sizes 1¼ inch, 1½ inch and 1¾ inch. In ordering, please mention the size or sizes wanted. Capacity 200 cupels an hour.

SPECIFICATIONS

The greatest dimensions of the machine are: Length, 24 in., width, 16 in., height, 19½ in.

Size	1¼ in.	1½ in.	1¾ in.	All three Combined
Weight, net	48 lbs.	48 lbs.	48 lbs.	59 lbs.
Weight, packed	69	69	69	90
Price	$40.00	40.00	40.00	60.00

NO 4223B RENEWAL PARTS FOR TABLE CUPEL MACHINE

Type		Price	Type		Price
B 1	Die, 1¼ inch	$ 4.00	B 14	Large Pin, Handle	$ .50
B 2	Die, 1½ inch	4.00	B 16	Cut Washer for Links	.10
B 3	Die, 1¾ inch	4.00	B 17	Pin for Plate	.25
B 4	Plate and Handle	3.00	B 18	Lock Nut, Knuckle Joint	.25
B 5	Frame	14.00	B 19	Lag Screw	.15
B 6	Cap Screw for Die	.25	B 20	Cotter	.10
B 7	Cap Screw Links B10	.25	B 21	Brass Plunger, 1¼ inch	6.00
B 8	Toggle Link	.50	B 22	Brass Plunger, 1½ inch	6.00
B 9	Small Pin, Toggle Link	.25	B 23	Brass Plunger, 1¾ inch	6.00
B 10	Connecting Link	.50	B 24	Plunger Pin	.10
B 11	Knuckle Joint	2.00	B 26	Pan	2.00
B 12	Handle ¾	2.00	B 27	Bolt for Pan	.25
B 13	Straight Link	.50	B 28	Lug for Pan	.25
B 15	Pin, Knuckle Joint	.25	B 29	Washer for Pan	.10

Extra Plunger and Die:

For making 1¼-inch Cupels	Set $10.00
For making 1½-inch Cupels	10.00
For making 1¾-inch Cupels	10.00

CUPELS, ETC.

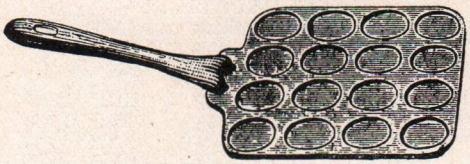
No. 4224A

4224A **CUPELS.** Our cupels are made from the best bone ash and have all the proper absorbing qualities.

Absorbing, gram's.	10	15	20	30	50	75	150
Diam. on top ....in.	1	1⅛	1¼	1½	1¾	2	2½
Price ....per dozen	$0.25	.30	.35	.40	.45	.60	.75
Price.....per 100	$1.50	2.00	2.25	3.00	3.50	4.00	6.00

4224B **"WONDER" CUPELS.** Not made of bone ash. They are made from a scientific compound carefully treated, they are of absolutely uniform composition and density. They are hard, do not crack and are guaranteed against breaking in shipment. For assay work with samples of ore, these cupels, made up for use, are far superior to the usual ones of bone ash. "Wonder" saves large percentage of silver. Their use requires but one caution: should be hot before receiving the button.

No.	Diam. Inches	Height Inches	Weight Packed, Lbs. (100)	(1000)	Price per 100
1	1	⅝	5½	65	$3.00
2	1¼	¾	7¾	90	3.50
3	1½	⅞	10	120	4.00
4	1¾	1	15	175	4.75
5	2	1⅛	22	240	5.50



No. 4224C

4224C **CUPEL TRAYS.** Holding 16 cupels, with detachable handle, all iron $0.75

4224D **CUPS, MINER'S.** Of agateware.

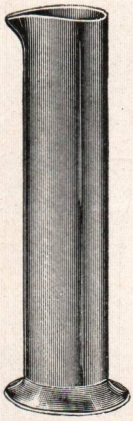
Capacity	.....pints	2	3
Price	.....each	$0.75	1.00

CUPEL RAKES, Iron. See under Tongs.

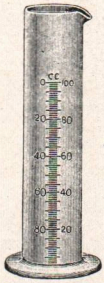
CUPEL SHOVELS, Iron. See under Tongs.

CUPEL TONGS. See Tongs.

CYLINDERS



No. 4225A



No. 4225B

No. 4225C

4225A **CYLINDERS,** Glass. With lip.

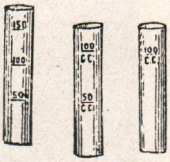
Height ..... ins.	5	6	7	8	10	12	12	15	15	15	18	18
Diameter ....ins.	1	1¼	1¼	1½	1½	1½	2	1½	2	2½	2	3
Each	$0.40	.40	.40	.45	.50	.55	.60	.70	.75	.80	1.00	1.25

4225B **CYLINDERS.** With ring-neck, same dimensions and lists as above.

4225C **CYLINDERS.** Plain, same dimensions and lists as above.

No. 4225D

No. 4225E



No. 4225F

4225D **CYLINDERS,** Glass. With ground-in stopper, double graduation in cc., reading up and down.

Capacity .....cc.	10	25	50	100	200	250	300	500	1000	2000
Each	$0.70	.90	1.10	1.25	1.55	1.65	1.85	2.55	3.60	6.00

4225E **CYLINDERS, GLASS.** With lip, double graduation in cc., reading up and down.

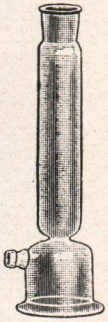
Capacity .....cc.	10	25	50	100	200	250	300	500	1000	2000
Each	$0.40	.50	.60	.70	1.00	1.10	1.30	1.50	2.00	6.00

4225F **CYLINDERS, NESSLER'S.** For ammonia test, of clear colorless glass, with polished bottoms.

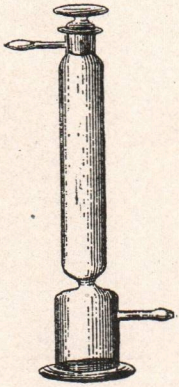
Capacity ..... cc.	50	100	50 and 100	50, 100 and 150
Each	$0.75	1.00	1.50	2.00

4225G **CYLINDERS,** for quick measuring of brass, with handle.
Capacity, 10 cc. Each.....$0.30

CYLINDERS AND DEMIJOHNS



No. 4226A



No. 4226B

No. 4226C

4226A **CYLINDERS, CHLORIDE CALCIUM.** Plain.
Height, 8, 12, 16, 20 and 24 inches.
Price on application.

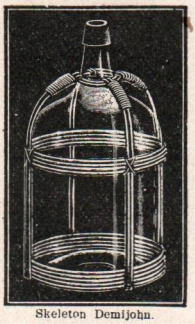
4226B **CYLINDERS, DRYING.** With perforated glass stopper.
Height, 11 and 14 inches; diameter, 1¾ and 2 inches.
Price on application.

4226C **CYLINDERS, HYDROMETER.** With enlarged top.

Height ....in.	12	16	18	20
Each	$0.40	.50	.60	.70

DEMIJOHNS

Pear Shaped.
No. 4226D



Skeleton Demijohn.
No. 4226E

DEFLAGRATING SPOONS. See under Combustion Spoons.

4226D **DEMIJOHNS, WICKERED.**

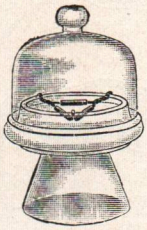
Capacity ....gals.	½	1	2	5
Each	$0.90	1.05	1.60	2.50

The 5-gallon size is oval and has two handles.

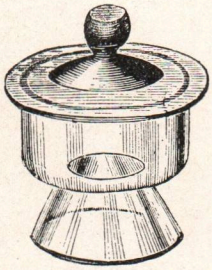
4226E **DEMIJOHNS, "SKELETON."** For laboratory work.

Capacity ....gals.	2	3	5
Each	$1.50	1.75	2.25

DESICCATORS



No. 4227A



No. 4227B

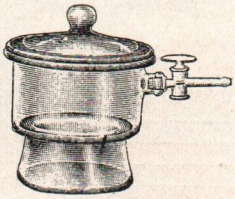
4227A **DESICCATORS, ATWATER'S.** With triangle.....each $3.25

4227B **DESICCATORS, SCHEIBLER'S.** With knob top, ground air tight.

Diameter ..... inches	4	5	6	8
Each	$0.90	1.40	1.90	6.25

4227C **DESICCATORS, SCHEIBLER'S.** Like No. 4227B above. With porcelain plate.

Diameter ..... inches	4	6
Each	$1.75	3.25



No. 4227D

No. 4227E

No. 4227F

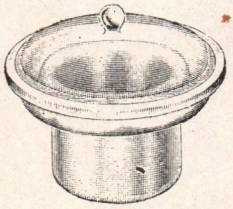
4227D **DESICCATORS, SCHEIBLER'S.** With side tube and stopcock ground in.

Inside diameter ..... inches	6	8
Price each	$5.50	9.00

4227E **DESICCATORS, FRESENIUS'.** With stopcocks ground in, top tubulature.
Inside diameter, 5 inches. Price on application.

4227F **DESICCATORS, HEMPEL'S.** Very perfect, from the fact that water vapor has a lower specific weight than air, and therefore accumulates in the upper part of the desiccator, which is overcome by placing the drying substance in the lower part of the cover.
Sizes, 4x4 and 6x5 inches. Price on application.

DESICCATORS



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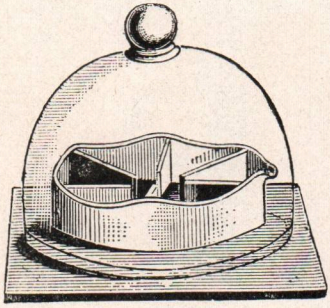
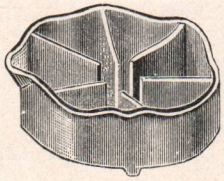


No. 4228B

4228A **DESICCATOR, REINHARDT'S.** This form possesses many advantages; the air-tight cover fits inside the rim and, therefore, cannot slip off. The drying material is placed in the upper broad rim, so that all the other space is available for drying purposes. Drying space, 6x6 inches. Price on application.

4228B **DESICCATOR.** Consisting of a porcelain acid dish and bell glass ground air-tight to heavy glass-plate. Diameter of bell jar, 6 and 8 inches. Price on application.



No. 4228C

No. 4228E

4228C **DESICCATOR PLATES,** glazed on one side, without feet. Type 621.

Size number	4	5
Diameter, mm.	190	230
Number holes	7	8
Diameter holes, mm.	30	30
Each	$1.75	2.10

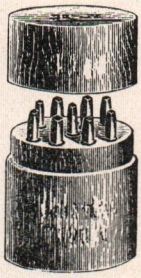
4228D **DESICCATOR PLATES,** glazed on one side, without feet, with numerous small holes. Thumb hole in center. Type 622.

Size number	4	5
Diameter, mm.	190	230
Number holes	700	900
Diameter holes, mm.	2	2
Each	$1.75	2.10

4228E **DESICCATOR PLATES,** glazed on one side, on three small feet. Type 620.

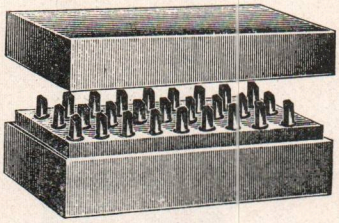
Size number	0	1	2	2a	2b	3	4	5
Diameter, mm.	85	95	115	120	125	140	190	240
Number holes	3	3	4	5	8	5	7	8
Diameter of holes	23	30	30	23	23	30	30	30
Each	$0.65	.75	.85	.95	1.10	1.25	2.00	2.50

DIES



No. 4229A

No. 4229E



No. 4229C

4229A **DIES,** Figures, of Steel, for stamping bullion, etc., hand cut, best quality.

Face, inches	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2
Set	$1.00	1.00	1.40	1.65	2.00	2.75	4.00	5.00

4229B **DIES,** Figures, of Cast Iron, for stamping wood, soft metals, etc.
Size ½ inch, per set $4.00
Size ¾ inch, per set 7.00

4229C **DIES,** Letters, of Steel, for stamping bullion, etc., hand cut, best quality.

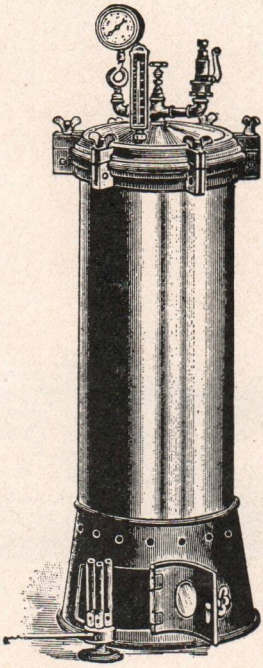
Face, inches	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2
Set	$3.00	3.00	4.25	5.00	5.75	8.25	12.00	15.00

4229D **DIES,** Letters, of Cast Iron, for stamping wood, soft metals, etc.
Size ½ inch, per set $10.00
Size ¾ inch, per set 15.00

4229E **DIES,** Steel Stamps, i. e., Letters or Figures in one piece.
Size, inches ⅛ ¼ 5/16 ⅜ ½
Prices upon application.

4229F **DIPPERS, AGATEWARE.** Extra strong, with wooden handles, for quicksilver.
No. 210. Emall size, 4¼x3 inch ..... each $0.80
No. 214. Large size, 6x3½ inch ..... each .90

AUTOCLAV OR DIGESTER



No. 5230A

STERILIZATION UNDER STEAM PRESSURE

4230A **DIGESTER OR AUTOCLAV,** for sterilizing under steam pressure. The boiler is made of extra heavy copper, tin-lined, is 24 inches deep and 11 inches in diameter, with a perforated rack inside. The lid is made of cast brass and nickel-plated. It is made with a ground joint, no washers being necessary to make it steam-tight; it is held in position by six screw clamps. The apparatus is tested and guaranteed to stand pressure of 50 pounds to the square inch, is provided with a pressure gauge, thermometer and safety valve; the latter is set at 30 pounds, but may be increased or decreased. There is a small pet valve which must be kept open until the steam escapes, thereby forcing all the air out of the boiler. The base is made of sheet iron and is 8 inches high; extreme height of the apparatus is 40 inches. Type 1080.
Price ..... $ 85.00

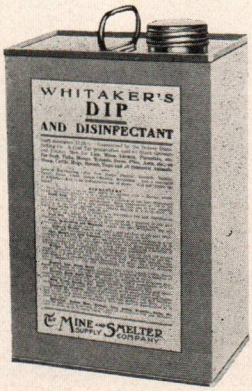
4230B Large size. Inside dimensions, 14x26 inches, extreme height including base, 46 inches. Type 1080.
Complete with four-tube burner 85.00

4230C Large size. Same as above, but nickel-plated 105.00

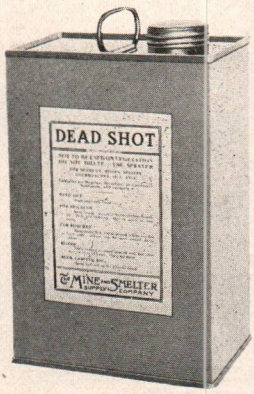
4230D Medium size. Inside dimensions, 11x24 inches. Extreme height including base, 44 inches.
Complete with three-tube burner 110.00

4230E Medium size. Same as above, but nickel-plated 125.00

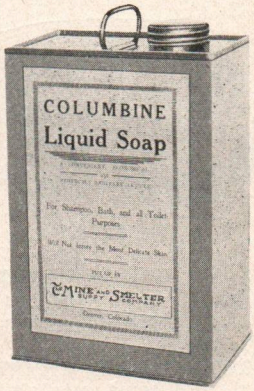
DISINFECTANTS



No. 4231A



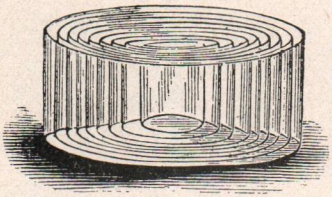
No. 4231B



No. 4231F

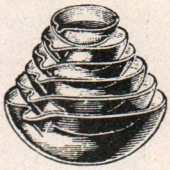
4231A	**WHITAKER'S DIP AND DISINFECTANT.**		
	12 in case, pints	each	$ .50
	12 in case, quarts	each	.75
	12 in case, ½ gallons	each	1.10
	6 (only), 1 gallons	each	1.75
	5 or 10-gallon case	gal.	1.50
	506-gallon barrel	gal.	1.25
4231B	**DEAD SHOT,** for bedbugs, moths, lice, etc.		
	24 in case, ½ pints	each	.25
	12 in case, pints	each	.50
	12 in case, quarts	each	.90
	12 in case, ½ gallons	each	1.50
	6 (only), 1 gallons	each	2.50
	5 or 10 gallons in case	gal.	2.00
	Prices in larger quantities on application.		
4231C	**SWEEPING COMPOUND.**		
	100-lb. box	each	3.00
4231D	**CEDAR OIL.**		
	½-gallon can	each	.85
	1-gallon can	each	1.50
	5 or 10 gallons	gal.	1.35
4231E	**FLY EXTERMINATOR.**		
	12 in case, 1-quart cans, makes 100 to 150 gallons	each	6.00
4231F	**LIQUID SOAP.**		
	1-gallon can	gal.	2.00
	5 or 10-gallon case	gal.	1.75
	50 gallons in cans	gal.	1.50
4231G	**LYPTO DRIP FLUID.**		
	1-gallon can	gal.	2.00
	5 or 10-gallon can	gal.	1.50
	50-gallon barrel	gal.	1.35
4231H	**SPRAYERS.**		
	12 in case, tin holds 1 quart	each	.75
	12 in case, tin holds 1 quart (double spray)	each	1.00
4231I	**LILAC ROACH POWDER.**		
	12 in case (large)	each	1.00

DISHES



No. 4232A

No. 4232B



No. 4232C

4232A **DISHES, CRYSTALLIZING.** Glass, with flat bottom and straight sides

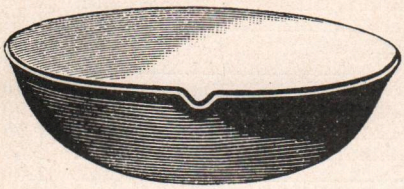
Dia. ....in.	2¼	2¾	3¼	3⅝	4	5	5½	6½	7½	8½	9½
Each	$0.15	.17	.19	.20	.25	.35	.40	.55	.85	1.00	1.25

4232B **DISHES, CRYSTALLIZING.** Porcelain. Glazed inside, with flat bottoms, straight side and with lip.

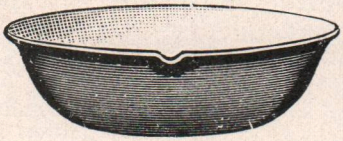
Diameter .....in.	6	8	10	11	12½
Each	$0.85	1.05	1.45	1.75	2.25

4232C **DISHES, EVAPORATING.** Glass, hemispherical, with lip.

Diameter .....in.	2	2½	3¼	4	4¾	5¾	6½
Each	$0.18	.20	.35	.45	.65	.75	.85



No. 4232D



No. 4232E

4232D **DISHES, EVAPORATING,** with lip. Sizes up to five are glazed inside and outside with exception of rim. Larger sizes are partly glazed outside. Type 501. (Coor's)

Size number	000	00	0	1	2	3	4	5	6	6a	7
Diameter, mm...	60	70	80	85	90	100	110	120	145	162	185
Height, mm.	24	27	30	33	37	42	43	50	48	51	54
Capacity, cc.	35	60	80	100	140	175	210	300	385	535	765
Each	$0.12	.18	.20	.30	.35	.40	.45	.55	.70	.80	.90

Size number	8	8a	9	10	11	12	13
Diameter, mm.	215	230	265	305	360	400	460
Height, mm.	63	70	80	95	116	140	175
Capacity, cc.	1,285	1,430	2,200	3,250	5,700	10,000	16,500
Each	$1.20	1.50	1.80	3.00	4.00	9.00	18.00

DISHES, EVAPORATION. Silica Ware. See under Silica.

DISHES

No. 4233C

No. 4233D

4233A **DISHES.** Pure solid nickel with dip.

Diam.	mm.	40	60	80	100	150
Each		$0.45	.65	1.00	1.40	2.40

DISHES. Platinum. See Platinum.

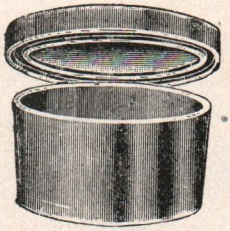
4233B **DISHES.** Pure silver. Any size made to order. Prices on application.

4233C **DISHES.** Liberty silver. Large, with lip and counterpoise for weighing sugar samples ..... each $4.50

4233D **DISHES, LEAD.** Shallow form.

Diam.	in.	2	2½	3	4	5	6
Each			.15	.20	.25	.35	.45

No. 4233E



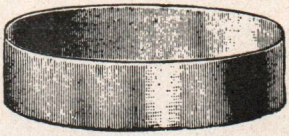
No. 4233F

4233E **DISHES, PETRI'S CULTURE.** A double dish, very flat, loosely fitting cover, diameter 4 inches ..... each $0.50

4233F **DISHES, PREPARATION.** These jars have no contraction at the top; the cover being grooved and ground makes them air-tight.

Size		A	B	C	D
Diam.	inch	2⅜	2⅜	2	1⅜
Height	inch	3½	1⅛	1	¾
Dozen		$2.00	1.80	1.50	1.20
Each		.20	.18	.15	.12

No. 4233G



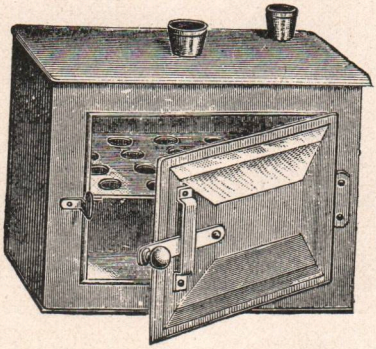
No. 4233H

4233G **DISHES, STAINING.** Watch glass form, beveled edge and flat bottom, with groove to allow setting upon top of each other, with ground mark on edge for writing on surface.
Each $0.35

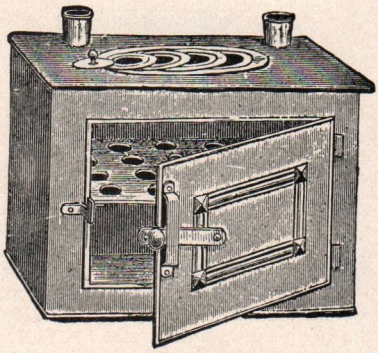
4233H **DISHES, ALUMINUM.** Flat bottom, straight sides for milk analysis and moisture determination.

Diam.	in.	2	2½	3
Height	in.	½	¾	⅞
Each		$0.30	.35	.40

DRYING OVENS



No. 4234A



No. 4234C

4234A **DOUBLE WALL.** For water, of heavy polished copper, tubulature for thermometer, ventilator, etc., adjustable shelf.

Size	inches	6x8	8x10	10x12
Without support	each	$10.00	15.00	20.00
With support	each	$12.00	17.00	22.00

4234B **SUPPORTS.** Of iron. With set screws holding oven in position.

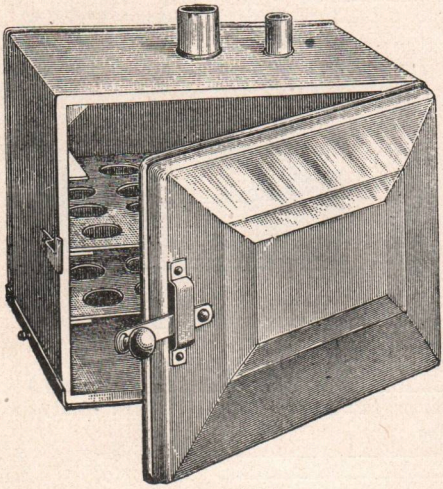
Size	inches	6x8	8x10	10x12
Each		$2.00	2.00	2.00

4234C **DOUBLE WALL.** Of copper. With extra water bath on top, opening for thermometer, movable shelf and extra sheet iron bottom.

Size	inches	6x8	8x10	10x12
Each		$12.00	16.50	23.00

4234D Same on four legs.

Each		$14.00	18.50	25.00



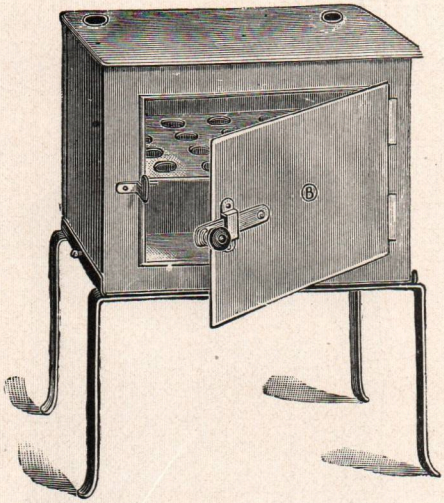
No. 4234E

4234E **SINGLE WALL.** Made of heavy polished copper, with tubulations for thermometer and gas regulator, extra sheet iron bottom, and supported on iron stand with set screw by which the oven is held firmly. The 6x8 and 8x10-inch sizes have one removable shelf, and the 10x12-inch size has two removable shelves. The 10x12-inch size is shown in the illustration.

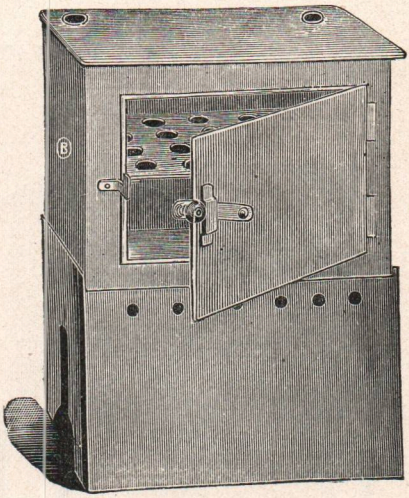
Size	inches	6x8	8x10	10x12
Without support	ea	$7.50	10.00	15.00
With support	ea	9.50	12.00	17.00

DRYING BATHS

DOUBLE WALL



No. 4235A



No. 4235B

DRYING BATH, made of polished copper, double wall, with tubulations for thermometer and gas regulator, extra sheet iron bottom.

Made in three sizes: 6x8 inches and 8x10 inches, with one removable shelf; 10x12 inches, with two removable shelves.

4235A **DRYING BATHS,** supported on iron stand, 8 inches high, with set screw by which the oven in held firmly. Type 1425.

6x 8 inches, outside dimensions	each	$10.00
8x10 inches, outside dimensions	each	15.00
10x12 inches, outside dimensions	each	20.00

4235B **DRYING BATHS,** supported on enclosed base, 8 inches high. Type 1426.

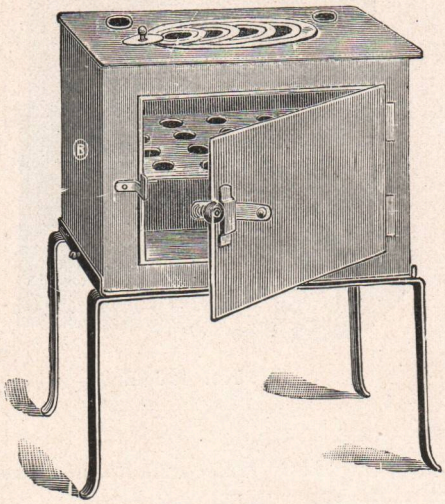
6x 8 inches, outside dimensions	each	$11.00
8x10 inches, outside dimensions	each	17.00
10x12 inches, outside dimensions	each	23.00

4235C **DRYING BATH,** for high temperatures, same as our Type 1425, but of extra heavy copper and all seams brazed; may be used with glycerine or other oils. Inside dimensions, 8 inches high by 10 inches wide by 9 inches Deep. Type 1428 ..... each 50.00

DRYING BATHS

DOUBLE WALL

WITH WATER BATH TOP



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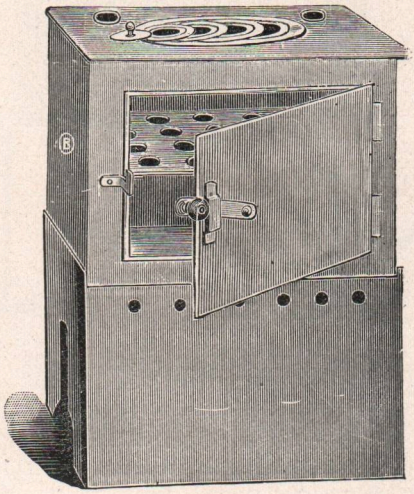


No. 4236B

DRYING BATHS, made the same as our Type 1425, but with a water bath top.

4236A **DRYING BATHS,** supported on iron stand 8 inches high, with set screw by which the oven is held firmly. Type 1430.

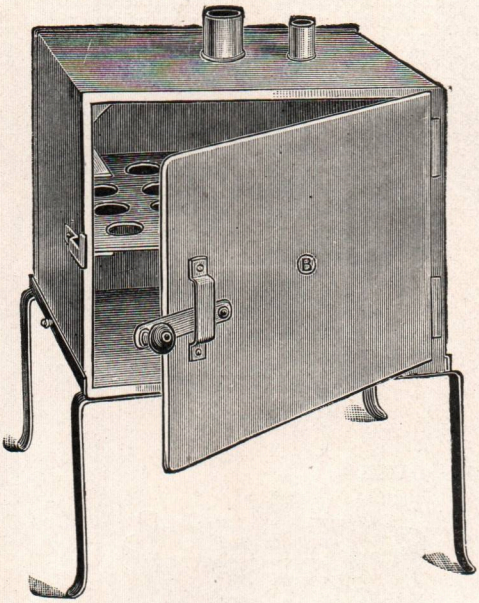
6x 8 inches, outside dimensions	each	$12.00
8x10 inches, outside dimensions	each	16.00
10x12 inches, outside dimensions	each	23.00

4236B **DRYING BATHS,** supported on enclosed base, 8 inches high. Type 1431.

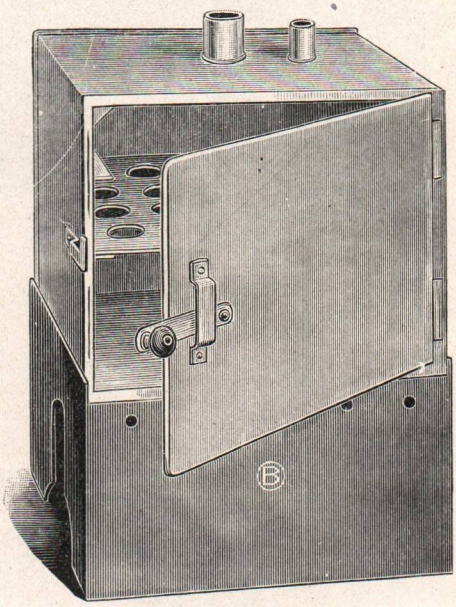
8x 8 inches, outside dimensions	each	13.00
8x10 inches, outside dimensions	each	18.00
10x12 inches, outside dimensions	each	26.00

DRYING OVENS

SINGLE WALL



No. 4237A



No. 4237B

DYING OVENS, single wall, made of polished copper, with tubulations for thermometer and gas regulator, extra sheet iron bottom.

Made in three sizes, 6x8 inches and 8x10 inches, with one removable shelf; 10x12 inches, with two removable shelves.

4237A **DRYING BATHS,** supported on iron stand, 8 inches high, with set screw by which the oven is held firmly. Type 1435.

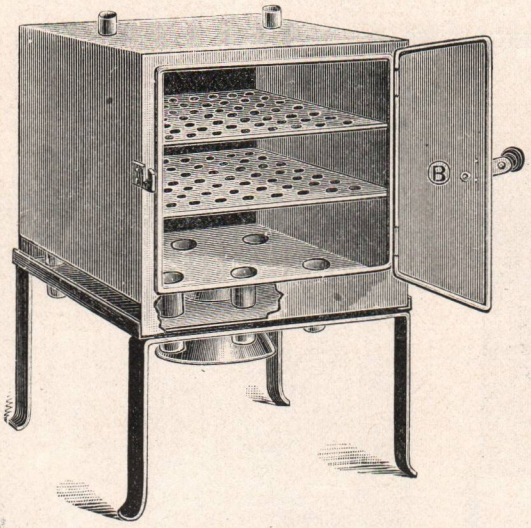
6x 8 inches, outside dimensions	each	$ 7.50
8x10 inches, outside dimensions	each	10.00
10x12 inches, outside dimensions	each	15.00

4237B **DRYING BATHS,** supported on enclosed base, 8 inches high. Type 1436.

6x 8 inches, outside dimensions	each	$ 9.00
8x10 inches, outside dimensions	each	13.00
10x12 inches, outside dimensions	each	20.00

DRYING OVENS

KAEHLER'S



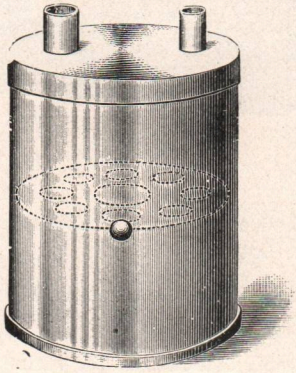
No. 4238A

4238A **DRYING OVEN,** single wall, Kaehler's, of polished Copper, with double bottom. The flame strikes the upper or true bottom and the heat also circulates between the two bottoms and around the six connecting tubes, heating the latter, through which a current of hot air enters interior of the oven, maintaining a constant temperature throughout, rapidly removing moisture, thus insuring quick evaporation.

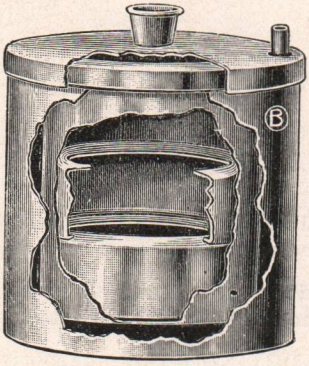
Size 10 by 10 by 12 inches wide; height, including Stand, is 21 inches.

Price .....each $25.00

RAMMELSBERG OVENS



No. 4238B



No. 4238D

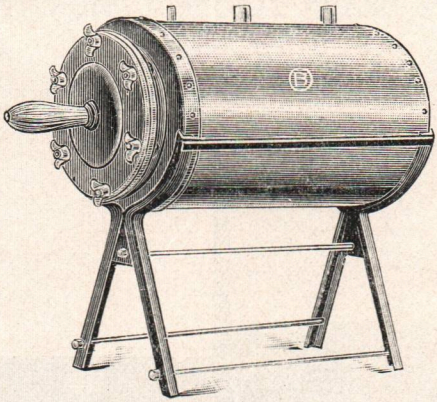
4238B **DRYING OVEN,** Rammelsberg, made of polished copper, size 6 inches high by 5 inches diameter. Type 1422.....each $ 4.00

4238C **DRYING OVEN,** Rammelsberg, made of polished copper, size 7 inches high by 6 inches diameter. Type 1423.....each 6.00

4238D **DRYING OVEN,** double wall, Rammelsberg's, made of heavy seamless copper, for hot air, water, oil or paraffine. Type 1424 .....each 17.00

Inside dimensions, 6 inches diameter by 7 inches deep.
Outside dimensions, 8 inches diameter by 8 inches deep.

DRYING OVENS

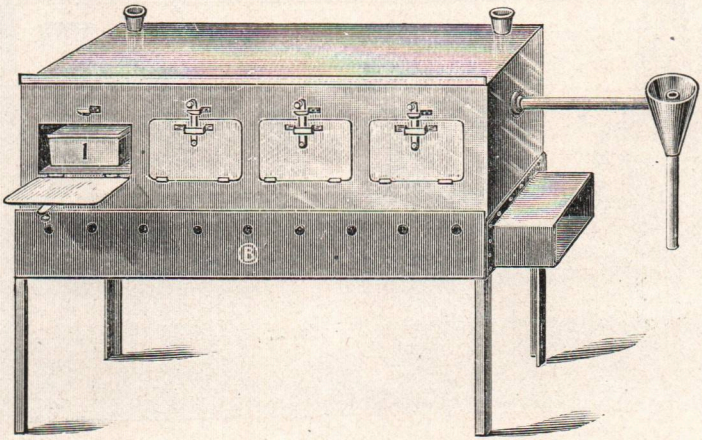


No. 4239A

4239A **DRYING OBEN**—double wall, for drying in current of hydrogen, etc. substantially made of heavy copper and provided with one shelf, outside dimensions 18 inches long by 10 inches diameter. Inside dimensions 17 inches long by 6¾ inches diameter.

Price .....each $75.00

DRYING BATH



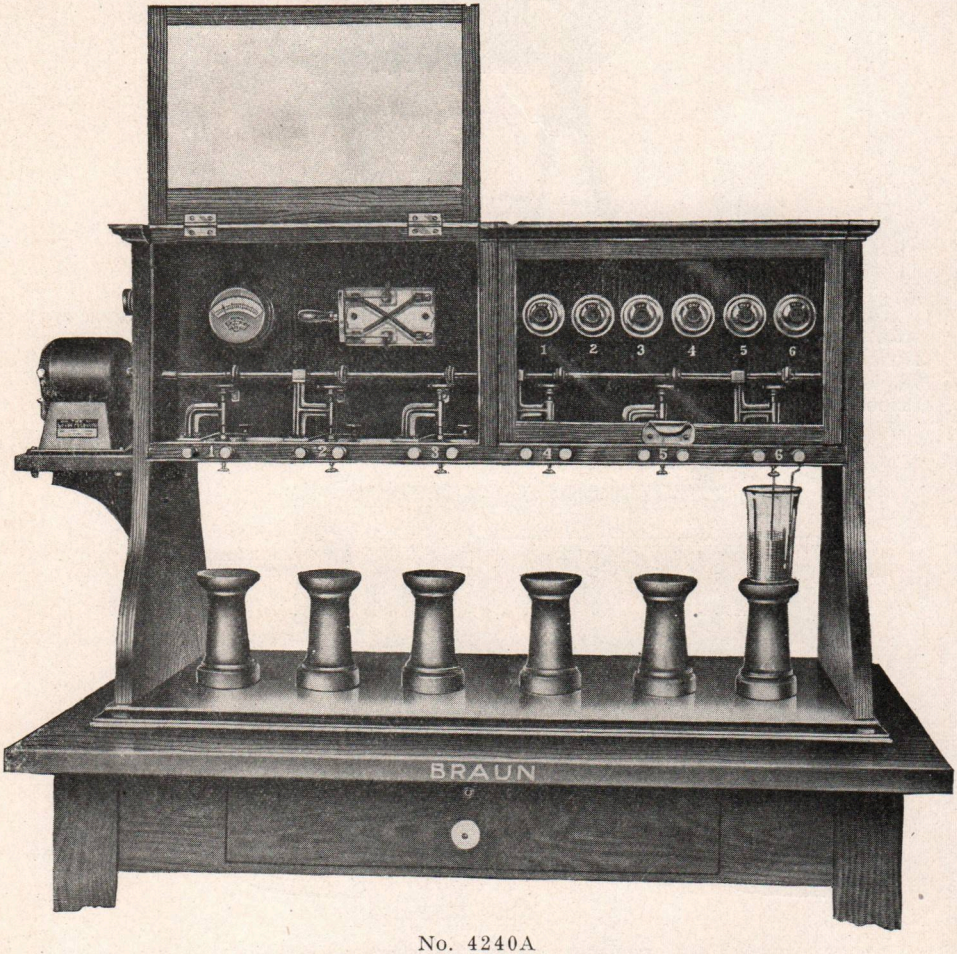
No. 4239B

4239B Type 1442. **DRYING BATH,** Dr. Blair, double wall, used in analysis of iron ores, made of heavy copper and mounted on a sheet iron base with legs. It has four compartments, each 4⅞ by 6 by 2½ inches high, and constant water level. The oven is 24 inches long, 7 inches high and 7 inches deep; the extreme length over all is 30 inches long and 19 inches high, including stand. It is supplied with four copper boxes, each numbered, size 4 by 4¾ by 1½ inches high. Type 1442.

Price .....each $50.00

THE BRAUN ELECTROLYTIC OUTFIT

(Formerly Known as the Herman.)



No. 4240A

THE SIX UNIT OUTFIT

Electrolytic determinations of copper ores with revolving anodes and gauze cathodes combine accuracy with rapidity.

Many new features are embodies in the Cabinet illustrated above, increasing the permanency of the apparatus, the ease of opration and prmitting the use of one or more units at one time.

See Next Page.

BRAUN ELECTROLYTIC OUTFIT

The Braun Eloctrolytic Outfit represents a marked improvement over those which preceded it. The improved apparatus is equipped with one motor to which a line shaft is connected and each unit is driven by a special friction device, enabling the operator to use one, two or more units at one time. The current through each unit is controlled by an individual swithch so that any unit may be connected or disconnected without disturbing any other. Revolving anodes and gauze cathodes are used giving not only the highest attainable accuracy, but great rapidity of operation as well.

These outfits are substantially built and, while they are not designed to be ornamental, they present a very neat and pleasing appearance. The ammeter, line shaft, bearings, switches and other operating parts, are all enclosed in the cabinet to prevent acid fumes from coming into contact with them. The lower portion of the cabinet is covered with aluminum and the binding posts are also made of the same material, which is resistant to acid fumes.

The motor is mounted to one side of the cabinet, the line shaft being connected to it by means of a flexible metallic belt. The speed is regulated by a rheostat. A separate rheostat is used to control the current supplied to the indvidual units.

Direct current is necessary for eloctrolysis and where alternating current only is available it is necessary to transform the alternating to direct current. The most practical and satisfactory method of accomplishing this is by the use of a Motor Generator set, such as listed below.

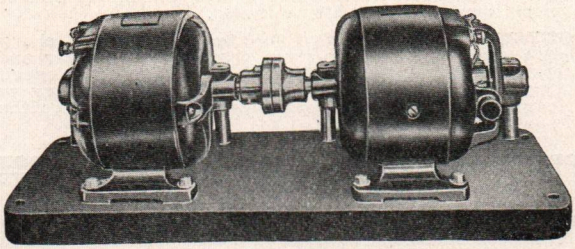
The **Braun Electrolytic Outfit** is the most modern and efficient apparatus for electrolytic determinations. Cabinets are made in sizes having two, four, or six units, the latter being the limit of operation with one motor. The regular equipment is for **110 volts,** but equipment for 220 volts can be supplied if desired and the fact stated in ordering.

Complete instructions for mounting and operating are furnished with each outfit.

4241A **BRAUN ELECTROLYTIC OUTFIT,** without Electrodes.

Units	2	4	6
Price, each	$125.00	175.00	225.00

For accessories and further information see next page.



No. 4241B

MOTOR GENERATOR—For operating six units or less. Always give voltage, phase and cycles of current available.

Price on application.

Platinum Anode
No. 4241C

ELECTRODES

The Anodes used with Braun Electrolytic Outfits are made in the shape of an elongated loop which in operation revolves and insures rapidity and uniformity of action throughout the eloctrolysis. The Cathodes may be either the platinum gauze or perforated PALAU, of cylindrical shape.

PALAU Ware is not suitable for use as Anodes.

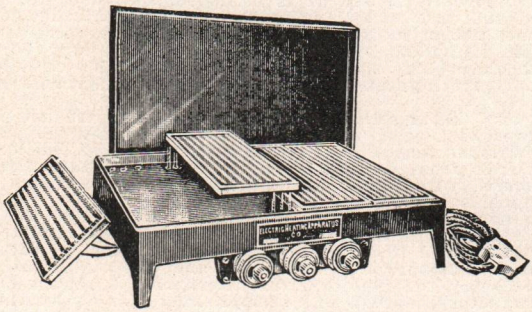
PLATINUM Anode, made of heavy wire with special loop. Weighs approximately 4.5 grams.

PLATINUM Gauze Cathode. made of platinum gauze, substantially constructed. Weighs approximately 9 grams.

PALAU Cathode, made of perforated PALAU metal of sufficient thickness to withstand rough usage. Weighs approximately 12 grams.

Prices on application.

Palau Cathode
No. 4241D



No. 4242A

PROCEDURE FOR COPPER ORES—Weigh 0.5 gram ore (1 gram for low-grade ores) into a 100 cc. tall beaker; add 5 cc. nitric acid and 2 cc. sulphuric acid; boil gently to fumes; cool; add 5 cc. nitric acid and 20 cc. water, and boil gently five minutes. Fill with cool water, allow to settle and eelctrolyze with 1.5 to 2 amperes.

For simple ores and concentrator products, weigh 0.5 to 2 grams as necessary, into the 100 cc. beaker; add 7 to 8 cc. nitric acid; boil gently with the beaker covered until free from nitrous fumes, leaving 5 to 6 cc. free acid. Fill with cool water, allow to settle and electrolyze as above.

For electrolyzing, ores averaging from 5 to 20 per cent copper require twenty minutes. For each 20 per cent additional value in ore, ten minutes more time is required. Bullion requires approximately fifty minutes.

THE ELECTROLYSIS—On standing five minutes all 0.5 gram charges are sufficiently settled to begin electrolysis. Two-gram charges take longer and fine slimes may not settle entirely. The latter may be filtered or the copper redeposited from the first cathode on a clean cathode for absolute results, but for ordinary work the first deposit is sufficiently accurate, the increase being but a few hundredths of one per cent.

ANALYSIS OF COPPER ORE IN THE PRESENCE OF MUCH IRON PYRITES, WHERE THE PRESENCE OF FERRIC SALTS REDISSOLVES METALLIC COPPER

FIRST METHOD—½ gram ore; boil with 10 cc. nitric acid until solution is complete (sulphuric acid used if necessary), dilute with water to 100 cc. and add 5 grams of urea; then electrolyze but avoid too long electrolysis, as otherwise urea will finally be decomposed and Ferric Salts formed. Add the urea just before electrolysis.

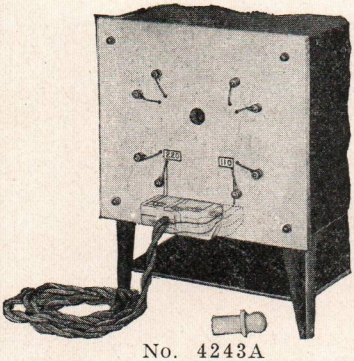
SECOND METHOD—Boil as before with 10 cc. HNO_3, in a 250 cc. beaker, but use 1 gram of ore. When ore is thoroughly decomposed dilute to about 170 cc. in a 200 cc. measuring flask, and then add 20 cc. of ammonia. Fill up to the mark with water, then pour into the original beaker quickly and stir with the neck of the measuring flask. Allow to settle and pipette off 100 cc. of the clear solution into the beaker to be used for electrolysis, add 5 cc. H_2SO_4 or 10 cc. HNO_3 and electrolyze. This procedure removes the iron and most of the other impurities which would interfere with copper electrolysis. Where much iron is present the results will be found to be low.

If approximately 30% iron is present, .3% of copper should be added to the result. This method is good for large amounts of work where much iron pyrite is present. Small amounts of arsenic and antimony do not interfere.

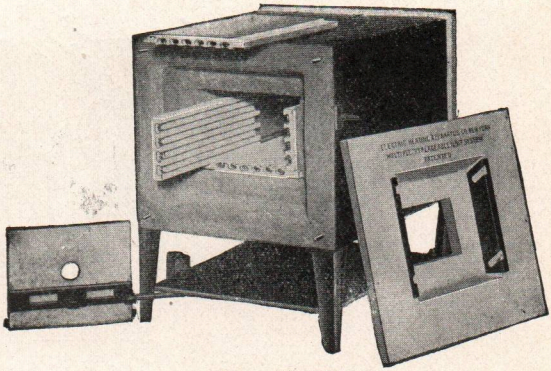
ORES CONTAINING LEAD—Dissolve ½ gram ore in nitric acid and run down with sulphuric acid to copious white fumes, cool, dilute and filter. The lead is left behind on the filter as lead sulphate. Add about 3 cc. nitric acid, dilute and then electrolyze; if iron is present in considerable quantity either add 5 grams urea or else start with 1 gram of ore and at the last stage add ammonia and proceed as directed for iron ores.

In the case of arsenical or antimonial ores, start with ½ gram or 1 gram, depending on future procedure, and roast in a small scorifier before treatment with acid. If desired, the ½ gram of ore can be roasted in an annealing cup. Small amounts of arsenic and antimony can be gotten rid of sufficiently merely by following directions given for iron ore.

CARE OF ELECTRODES—At the end of electrolysis, the moment the current is turned off, it is advisable to place cathode in beaker of water without taking time to disconnect. Then dip in alcohol, dry and place on tray. The deposits are hard and firm, eliminating any danger of removal of cupper by handling. The electrodes are cleaned by dipping in nitric acid, washing thoroughly and allowing to stand.



No. 4243A



No. 4243B

By means of the Multiple Unit feature of this System, all units composing the heating members of the furnace, that is, parts contaning the Heat Producing Resistor Coil,—are independently inserted into the furnace chamber to form a compltte Muffle, Crucible or Tube form. Being wholly contained in the heating chamber all heat generated is effeective, making the efficiency higher than in any other electric furnace.

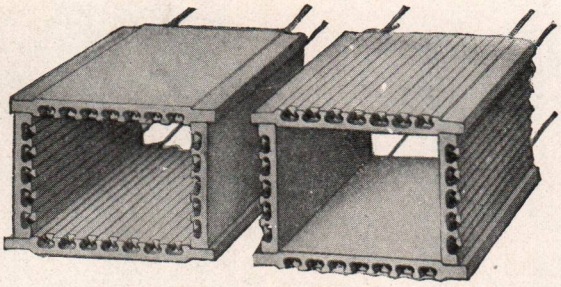
Th Multiple Unit System is patented and covers the means of retaining the resistor wires or coils in an undercut groove. This undercut groove may be presented to the heating chamber, thereby utilizing all the heat generated, and allows for the rewiring of a unit. No cement is used for imbedding the wires as in other systems.

The above feautre enables the operator to remove the one unit which may have burnt out, thus leaving the other unit or units in the furnac for further service.

In other systems of wire wound furnaces, the resistor element is wound around a single muffle, tube or core (according to the type of furnace), and covered with cement. The entire lining of the heated chamber has to be removed and rewound or replaced when a burnout occurs. The form of such construction requires the return of furnace to the manufacturer for repairs,—or in a few cases, where an entire renewable element is supplied, the new single unit is replaced after several hours time, and at a cost three to five times greater than similar repairs in a Multiple Unit Furnace. Any unit, in case of a burnout in the Multiple Unit System can be easily replaced in five minutes time by the operator.

In the late Model Furnace, the units are of one piece, thus eliminating the connector rods and clamps of the older models. All connections of the units are made by means of the ends of the heating wires, extending to the outside of the rear, or bottom heads, according to the type or form of furnace. These terminals are in turn attached to air-cooled binding posts where all contacts are readily made. Binding posts are of Monel-metal, non-corrosive even under severe oxidizing conditions. Binding nuts are brass. Under the destructive action of laboratory gases, contacts remain readily susceptible to easy adjustment for replacing units after long service.

The material from which the units are made is similar in appearance to unglazed china. It has high electrical insulation qualities and at the same time is an efficient thermal conductor. Units have a smooth finish. Being non-abrasive, they are not destructive to Platinum nor other expensive ware, and will not flake off in heating and cooling.



No. 4244A

HIGH EFFICIENCY—That the efficiency of the Multiple Unit Furnace, 1914 Model, is of the highest attainable, is shown by these features:

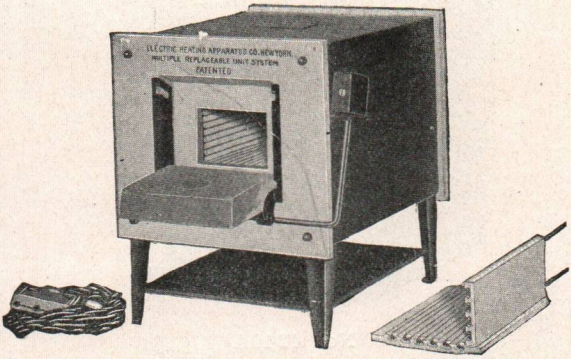
A type 50 Muffle Furnace, starting from cold and developing 1600° F. (870°C.) in 45 minutes time, showed an actual surface temperature on the furnace shell of only 110° F. (43°C.). In subsequent time, there is but a small increase of surface temperature,—the heat loss therefore, through radiatiion is of but small per cent. This is characteristic of all types.

The high efficiency of heat insulation, lessens the duty performed by the resistor wire, because the currrent flowing is of safer volume compared to the actual carrying capacity of the wire, and results in greatly prolonged life.

INTERCHANGEABLE VOLTAGES—All Multiple Unit Furnaces, whether of the Muffle, Crucible or Tube Types, are Interchangeable for 110 or 220 volts (with the exception of "Incased-Rheostat Types, and Type 80). This Interchange of Voltage is made possible by a selective form of Connector Plug.

The Interchange of Voltage converts all such furnaces into the two-heat type when used on 110 Volts. Using 110 Volts on the 110 V. Connecting Pins gives standard temperature ranges; using 110 Volts on the 220 V| Connecting Pins, gives approximately 50% of the higher temperatures of standard connections, and saves 75% of the current.

WIRE USED—Only the best Nickel-Chromium Resistance Wire is used in Multiple Unit Furnaces. The wire is non-corrosive in ordinary use; has a melting point of approximately 2750° F., and an electrical resistance of about 60 times that of copper. Wire of extremely large diameter is used to insure a long life at high temperature. In the life test with the Type 77 Combustion Tube Furnace, where 1576 hours was attained at 1900° F., the diameter of the wire was .032″, whereas in other furnaces, according to the types and sizes, the size varies up to .057″ diameter. As the gradual deterioration of the wire is caused solely by oxidation it may be readily seen that the large diameters used are conductive to long life.



No. 4245A

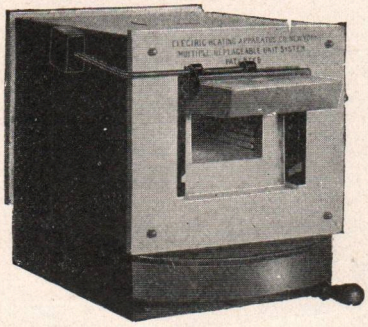
TEMPERATURES — The nameplates on all furnaces are stamped "Safe Working Temp.....° F." and "Maximum Temp.....° F." The "Safe Working Temperature" indicates the heat which may be used indefinitely without appreciable detriment to the wire. The "Maximum Temperature" indicates the safe heat for intermittent periods of comparatively short duration. All furnaces, however, will exceed the safe working temperature if left on indefinitly. For this reason a controlling device is preferable, and economical.

TEMPERATURE MEASUREMENTS—Most of the temperatures at which Electric Furnaces are operated in commercial practice, are in excess of the temperature which can be measured by a glass stem thermometer,—for this reason, Electric Pyrometers—acting independently of the furnace circuit—are uset. Electric Pprometers, by means of a Thermocouple which is directly inserted into the heated chamber, generates a current measured in a Galvanometer, the scale of which is graduated in either degrees Farenheit or Centigrade. Because one of the chief features of an Electric Furnace, as its ability to be operated at a constant temperature, the use of Pyrometers for indicating the temperatures cannot be too strongly advised.

MUFFLE FURNACES

The Units of all Multiple Unit Muffle Furnaces are reversible for using either the open groove or closed face, presented to the muffle chamber. When assembled with the closed faces presented to the heated chamber, the time required for heating is only 3% slower than the Open Groove system—made possible by the high thermal conductivity of the unit material.

The depths of all Muffle chambers in Multiple Unit Furnaces are two to three inches deeper than the muffle chambers of similar size furnaces of other makes. The added depths of course give greater ranges of use.



No. 4246A

STANDARD MUFFLE FURNACE — This design is used with Rheostat. Has a metal shelf under furnace body which oners a convenient place for temporarily placing tongs, crucibles, etc.

Temperatures—All Muffle Furnaces have a safe working temperature for continuous duty of 1750° F. (955° C.) and a maximum temperature for intermittent work of comparatively short duration 1850° F. (1010° C.).

Time Required in Heating—On all normal voltages of standard rating, any Muffle Furnace reaches 1400° F. (760° C.) in 30 to 35 minutes' time; 1800° F. (982° C.) in 50 minutes' time.

This speed in heating is quicker than in any similar form of Electric Furnace of other makes, and relative sizes.

Voltages—Standard Muffle design may be operated on either 110 or 220 volts —made interchangeable for either voltage by means of selective plug supplied with furnace.

Incased-Rheostat Muffle Type is used on 110 or on 220 Volts—is not interchangeable.

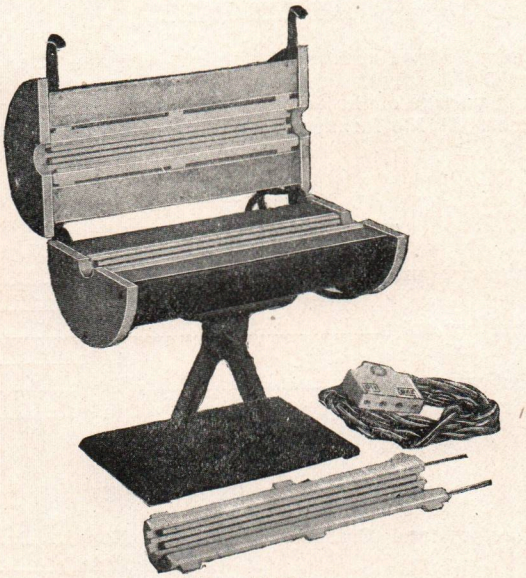
Furnaces for any voltage, other than 110 or 220 Volts, up to 250 Volts are wound special at no advance in price. Furnaces of standard rating either 220 or 110 Volts may be used on all voltages 215 to 230 Volts or 105 to 115 Volts respectively.

Equipment—Each furnace is equipped with six feet of flexible leads and connector plug. Full instructions for attaching to the Line Circuits and Method of Operation are given on instruation Tag attached to each furnace.

All furnaces have a ⅞″ diameter Vent Hole or Pyrometer Couple Hole in the rear head. An asbestos molded plub is supplied for closing Vent Hole.

Reversible Doors—Doors are reversible for Hinging at Bottom of door opening, or for Hinging at Top—as shown in cuts above. Reversing of position requires only the loosening and resetting of setscrews holding counter-weights, to secure the proper poise in the reversed position.

All doors have a ¾″ diameter clear vision Mica Peephole, Air Tight, vastly superior to the pivoted suspended cover used on similar furnaces of other makes. The Mica covered hole permits of observation at all stages of operation without admission of air which sometimes would be a serious disadvantage.



No. 4247A

TYPE		50	52	54	56
Inside sizes:	Width, inches	3 ¼	4 ¼	5 ¼	7 ½
	Height, inches	2 ½	3	3 ¾	5 ¼
	Depth, inches	7	10	12	14
Weight packed, pounds:	Furnace only	65	100	135	205
	With Rheostat	72	107	148	250
4247A	**Standard Muffle Furnace**—Price	$65.00	80.00	105.00	140.00
4247B	With Rheostat—Price	$75.00	93.00	124.00	173.00

Note—Always specify voltage when order includes rheostat.

These prices aply for all voltages 105 to 115 and 215 to 230 volts. Add 5% for all other voltages up to 250. (No extra charge on Rheostats to 250 volts.

4247C **INCASED-RHEOSTAT MUFFLE FURNACE** — Built with rheostat mounted in housing below the furnace body. Not only presents the rheostat in position for most convenient use, but eliminates considerable wiring which otherwise would be exposed and somewhat unsightly.

TYPE		60	62	64	66
Inside sizes:	Width, inches	3 ¼	4 ¼	5 ¼	7 ½
	Height, inches	2 ½	3	3 ¾	5 ¼
	Depth, inches	7	10	12	14
Weight packed, pounds		70	105	135	245
Price		$83.00	105.00	135.00	190.00

Note—Always specify voltage.

Kilo Watt Hours Consumed.

Type	Rating 110V	Rating 220V	Watts	In Reaching 1400°F. (760°C.) From 75°F.	Holding 1400°F. (760°C.) Per Hour
50 & 60	9.1 Amps.	4.55 Amps.	1000	.5 K. W.	.39 K. W.
52 & 62	13.1 Amps.	6.55 Amps.	1440	.72 K. W.	.89 K. W.
54 & 64	18.8 Amps.	9.4 Amps.	2070	1.2 K. W.	1.37 K. W.
56 & 66	31.0 Amps.	15.5 Amps.	3400	2.0 K. W.	2.5 K. W.

REPAIR PARTS

Always specify Voltage and serial number. On and after June 28, 1918, the manufacturers will not supply repair parts for Furnaces or Devices unless the serial number and voltage of the device for which the repair parts are ordered is given on the order. Muffle furnaces require 2 units each top and side units per furnace.

No. 4248A

TYPE 50 or 60 MUFFLE

Refractory and Coiled wire	Top	$4.15
	Side	3.30
Refractory only	Top	2.20
	Side	1.95
Coiled wire only	Top	1.95
	Side	1.35

No. 4248B

TYPE 52 or 62 MUFFLE

Refractory and Coiled Wire	Top	$6.60
	Side	4.95
Refractory only	Top	3.55
	Side	2.75
Coiled Wire only	Top	3.05
	Side	2.20

No. 4248C

TYPE 54 or 64 MUFFLE

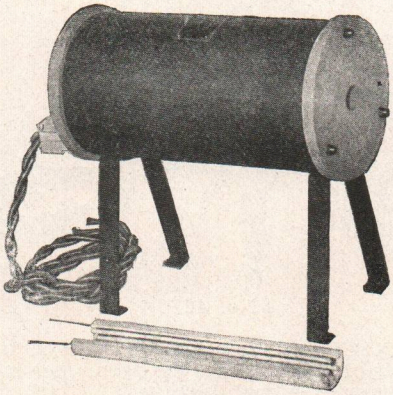
Refractory and Coiled Wire	Top	$9.90
	Side	7.70
Refractory only	Top	4.95
	Side	3.85
Coiled Wire only	Top	4.95
	Side	3.85

No. 4248D

TYPE 56 or 66 MUFFLE

Refractory and Coiled Wire	Top	$14.85
	Side	10.45
Refractory only	Top	7.40
	Side	5.20
Coiled Wire only	Top	7.45
	Side	5.25

Above prices on Complete Unit and Coiled Wire only apply for all Voltages 105 to 115 and 215 to 230. Add 20% to Coiled Wire only, prices for all other voltages up to 250.



No. 4249A

COMBUSTION TUBE FURNACES—Furnaces of this type, while designed primarily for combustion work, have been used extensively for enameling or hardening tubes, rods, helical springs, etc., and for Pyrometer Calibration.

Time Required in Heating—The Standard Combustion Furnace, Type 77, reaches 1832° F. (1000° C.) in 45 to 50 minutes' time. The Hinged Combustion Furnace, Type 70, reaches the same temperature in 40 to 45 minutes.

Temperature—All combustion Tube Furnaces have a safe working temperature for constant duty 1832° F. (1000° C.) and a maximum temperature for intermittent work of comparatively short duration 1950° F. (1065° C.).

Equipment—Each furnace is equipped with six feet of Flexible Leads and Connector Plug. Instruction tag is attached to furnace.

Rheostats—Because of the exactness with which all combustions are developed it is practically necessary that rheostats be used.

It has been definitely shown by careful test work that a variance of 90° F. (50° C.) may cause a variance of .01% to .1% either way from the exact content of the sample.

For Pyrometer Calibration—Because of the absolute uniformity of temperature and the definiteness of contral, the Standard Combustion Tube Furnace when fitted with an Alundum Tube, is without equal for Pyrometric Calibrations.

4249A **STANDARD TUBE DESIGN**—Type 77. Principal use is in the determination of the Content of Carbon in Steel and Iron.

Price, With Rheostat, F. O. B. Factory $39.00
Without Rheostat 29.00

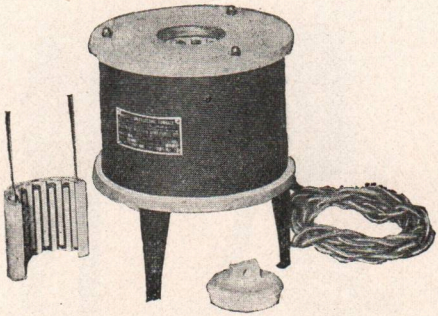
4249B **HINGED DESIGN COMBUSTION FURNACES**—Type 70. This offers a convenient form of combustion furnace where standard combustion work or special organic analysis is required.

Price, With Rheostat, F. O. B. Factory $56.00
Without Rheostat 45.00

KILO WATT HOURS CONSUMED

Type	Rating 110V	Rating 220V	Watts	In Reaching 1832° F. (1000° C.) From 75° F	Holding 1832° F. (1000° C.) per Hour	Sizes Inside Inches Diam.	Sizes Inside Inches Length	Weights Furnace Only	Packed With Rheostat
77	5.1 Amps.	2.55 Amps.	560	.355 K. W.	'40 K. W.	1¼"	12"	25 lbs.	29 lbs.
70	6.8 Amps.	3.4 Amps.	750	.420 K. W.	.615 K. W.	1¼"	12"	33 lbs.	40 lbs.

Note—Always specify voltage when order includes rheostat.



No. 4250A

CRUCIBLE FURNACES—This form of furnace is used extensively for melting small quantities of base metals; for pyrometer calibration when couples are immersed in molten salts or metals.

Temperatures—All Crucible Furnaces have a safe working temperature of 1832° F. (1000° C.) for continuous duty, and a maximum temperature of 2000° F. (1095° C.) for comparatively short periods of intermittent work.

Time Required in Heating—Types 82, 84 and 86 reach 1400° F. (760° C.) in 25 to 30 minutes' time; 1832° F. (1000° C.) in 45 to 50 minutes' time.

Type 80 reaches 1400° F. (760° C.) in 15 minutes' time and 1832° F. (1000° C.) in 30 minutes' time.

The excess speed of the Type 80 has been found desirable because mostly used for intermittent quick work in Decalescent Determination of carbon steel.

Voltages—Type 80 is designed for use on 110 or on 220 Volts. We strongly recommend its use on 110 Volts, because the amperage being extremely low, it may be operated from a lamp socket of a lighting circuit. When Type 80 is ordered for 220 Volts, a 220 Volt rheostat must be supplied—will not be furnished without rheostat. This is made necessary by the size of the crucible chamber prohibiting the use of wire sufficiently large in diameter to give satisfactory service at the higher voltage.

All other sizes, Types 82, 84 and 86 are interchangeable for 110 and 220 Volts.

KILO WATT HOURS CONSUMED

Type	Rating Amperes 110V	Rating Amperes 220V	Watts	In Reaching 1400° F. (760° C.) From 75° F.	Holding 1400° F. (760° C.) per Hour	Sizes Inside Inches Diam.	Sizes Inside Inches Deep	Wgts. Fur-nace Only	Wgts. Packed With Rheo-stat
80	3.55		390	.095 K. W.	.20 K. W.	2⅜	2½	16	20
80		3.55	780	.325 K. W.	.40 K. W.	2⅜	2½	16	30
82	4.4	2.2	484	.20 K. W.	.25 K. W.	2⅜	4	22	26
84	5.0	2.5	550	.23 K. W.	.325 K. W.	3	3½	25	29
86	6.6	3.3	725	.3 K. W.	.37 K. W.	3	5	30	34

Note—Always specify voltage when order includes rheostat.

		With Rheostat	Without Rheostat
4250A	Price, Type 80, 110 volts	$36.00	$26.00
4250B	Price, Type 80, 250 volts	39.00	--------
4250C	Price, Type 82	41.00	32.00
4250D	Price, Type 84	49.00	39.00
4250E	Price, Type 86	64.00	50.00

Note—Type 80 for 250 volts not sold without rheostat. Above Furnace prices apply for all voltages 105 to 115 and 215 to 230 volts. Add 5 per cent for all other voltages up to 250. (No extra charge on rheostats to 250 volts.)

REPAIR PARTS

Always specify Voltage and serial number. On and after June 28, 1918, the manufactureres will not supply repair parts for Furnaces or Devices unless the serial number and voltage of the device for which the repair parts are ordered is given on the order. Crucible furnaces require 2 units each Top and Side Units per furnace.

4251A **CRUCIBLE FURNACE,** Type 80.

Refractory and Coiled Wire	$3.00
Refractory only	1.25
Coiled Wire only	1.75

4251B **CRUCIBLE FURNACE,** Type 82.

Refractory and Coiled Wire	3.85
Refractory only	1.65
Coiled Wire only	2.20

4251C **CRUCIBLE FURNACE,** Type 84.

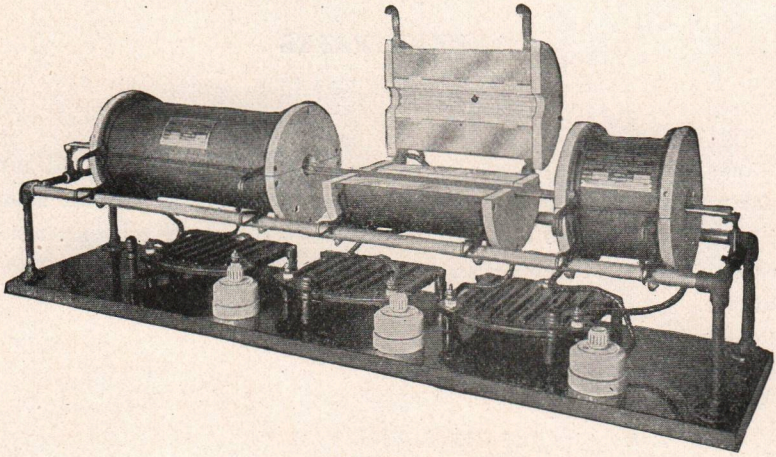
Refractory and Coiled Wire	4.15
Refractory only	1.95
Coiled Wire only	2.20

4251D **CRUCIBLE FURNACE,** Type 86.

Refractory and Coiled Wire	5.25
Refractory only	2.25
Coiled Wire only	3.00

Above prices on Complete Unit and Coiled Wire only apply for all Voltages 105 to 115 and 215 to 230. Add 20% to Coiled Wire only prices for all other voltages up to 250.

COMBUSTION FURNACE



No. 4252A

COMBUSTION FURNACE. It is responsive to all conditions of quick or slow heating or cooling, combined with absolute temperature control, and easily accessible of observation during all operation. Each section during any one operation of combustion can be used independently and is easily moved along the rails to provide for combustion at different points. The individual switches and hreostats mounted on the base afford a means of operating each furnace independently. For observation purposes during the operation, and without shutting off the heat, the upper half may be raised, exposing the glass combustion tube. It eliminates fumes and has effective heat insulation and definite temperature control. The units are replaceable by the operator, thus enabling him to have an extra or spare unit on hand for any emergency. Each furnace when used on full rated voltages reaches 1200° F. (650° C.) in fifteen minutes or 1832° F. (1000° C.) in forty minutes. Lower temperatures attained slowly by sliding the rheostat into circuit, shutting off the current and opening the upper half for rapid cooling. Cools each furnace to 900° F. (480° C.) in 5 minutes and to 600° F. (315° C.) in ten minutes. Furnace sections are 4, 8 and 12 inches long respectively. Complete as illustrated. F. O. B. factory. State voltage when ordering.

4252A Type 123. Each $150.00

COMBUSTION FURNACE, for elementary organic analysis, Dennstedt Method. Similar in construction to Type 1674 with sections 3, 6 and 8 inches, and uses 1,300 watts. F. O. B. factory. Prices for units, rewiring and nickel trough are the same as Type 1674.

4252B Type 122-S. Each 150.00

ACCESSORIES

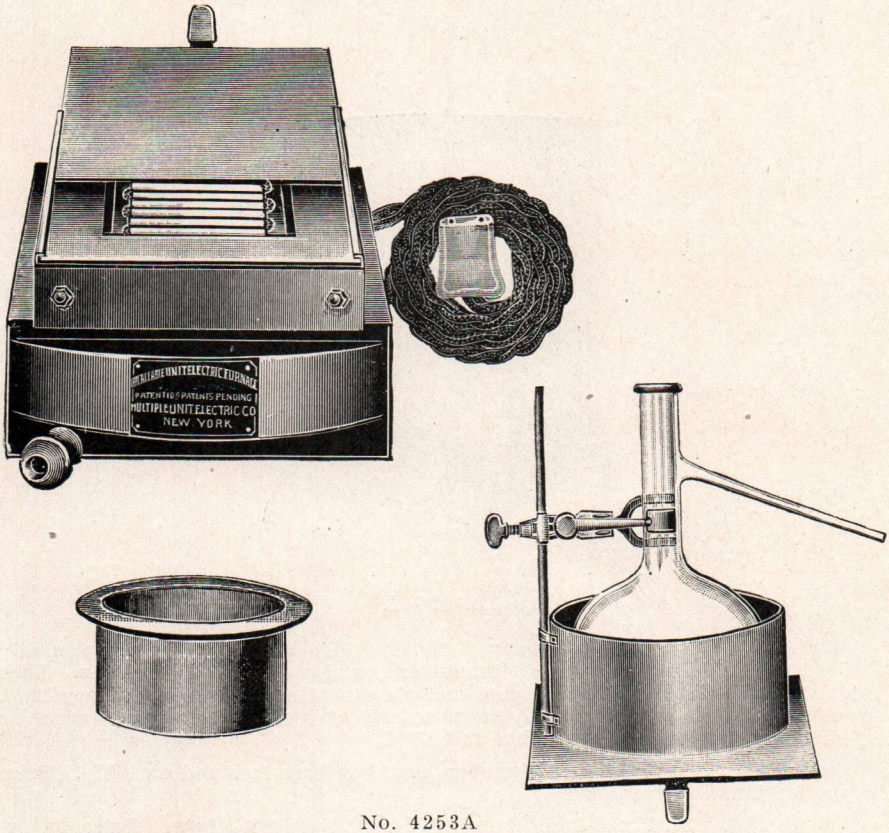
4252C **NICKEL TROUGH** for combustion tube support, each 39½ inches long. Each 4.50

UNITS

Each section requires 2 units. F. O. B. factory.

			Complete	Refractory	Coiled Wire only
4152D	Type 1	4-inch for 110 or 220-volt	$3.75	$1.50	$2.25
4252E	Type 2	8-inch for 110 or 220-volt	4.75	1.75	3.00
4252F	Type 3	12-inch for 110 or 220-volt	5.25	2.00	3.25
4252G	Type 15	3-inch for 110 or 220-volt	4.00	1.50	2.50
4252H	Type 25	6-inch for 110 or 220-volt	5.00	1.75	3.25
4252I	Type 35	8-inch for 110 or 220-volt	5.50	2.00	3.50

FLASK HEATERS



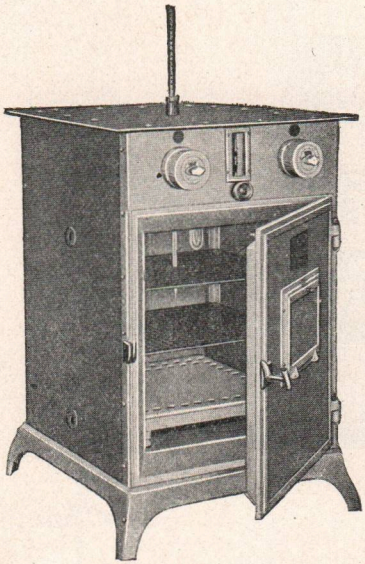
No. 4253A

FLASK HEATER, Combination Electric. This apparatus offers a practicalappliance where a combination of flask heater, small hot plate and sand bath are required at various times, the unit being replaceable eby the operator. The base or housing consists of a heavy sheet steel casing which contains the rheostat for controlling the various temperatures desired, and the upper part of the casing on each side is flanged inward, forming a groove to receive the several attachments. For flask heating, distilling, etc., the hot plate attachment is removed and the flask heater attachment applied in its place. When the sand, oil or water bath is required, the sand bath attachment (either size) is inserted into the base of the flask heater attachment. The maximum temperature is 1000° F. (540° C.) which may be controlled to a temperature sufficiently low for ether and alcohol extractions. Complete with flask heater attachment, hot plate, slide, two sand bath attachments, connector cord and plug.

4253A	F. O. B. factory. Type DFH, complete	$50.00
4253B	Extra Units (one required for each apparatus). Each	5.00
4253C	Coiled Wire, per unit	3.00

State voltage when ordering.

DRYING OVENS



No. 4254A

4254A **DRYING OVEN,** Elecric, Freas Type R; for temperatures up to 180° C. Used regularly for moisture determinations and sterilization purposes. Each oven is furnished with a flexible cord and plug to fit socket of the ordnary lighting circuit also with a high grade thermometer of special design and long stem on which the graduations are etched to 200° C.

Type 100. 12x12x12-inch chamber, cast iron base to stand on table. Price on application.

Type 110. 14x17x18-inch chamber, heavy base with legs. Price on application.

Type 136. 26x14x22-inch chamber, heavy base with legs. Price on application.

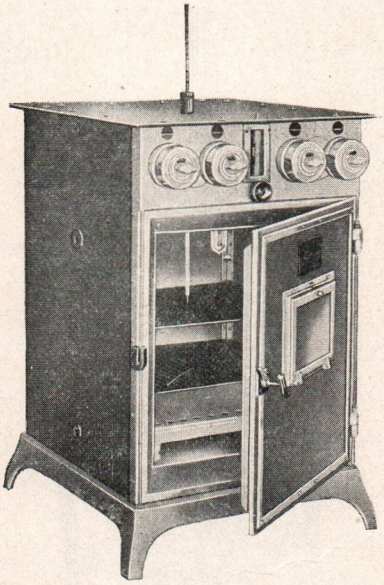
Type 140. 32x18x24-inch chamber, heavy base with legs. Price on application.

4254B **DRYING OVEN,** Electric, Freas, Type H. T. They are identical with Type 2215, except that they are provided with two heat switches, one of which can be turned off when the desired temperature has been reached and are specially wired so that a range of temperature from that of the room to 260° C. may be obtained. Used largely in making baking tests on bread and other food, testing asphalt, enamels, rubber, high flash point of oils, etc. Supplied with a high-grade thermometer of special design and long stem on which the graduations are etched to 300° C.

Type 104. 12x12x12-inch chamber, case iron base to stand on table. Price on application.

Type 114. 14x17x18-inch chamber, heavy base with legs. Price on application.

DRYING OVENS



No. 4255A

4255A **DRYING OVEN,** Electric, Freas, Type C. This type is equipped with a removable inside glass door and a low wattage heating plate in addition to the regular heating plate, which allows it to be used as a combined drying oven and incubator. When equipped with the inside glass door and low wattage heating plate, it becomes a Freas Electric Incubator with temperature range from that of the room to about 70° C. When used as a drying oven with the high wattage heating plate the range of temperature is from that of th room to 180° C. Each oven is supplied with a flexible cord and plug to fit the socket of the ordinary lighting circuit and with a high grade thermometer of special design and long stem on which the graduations are etched to 200° C.

Type 102. 12x12x12-inch chamber, cast iron base to stand on table. Price on application.

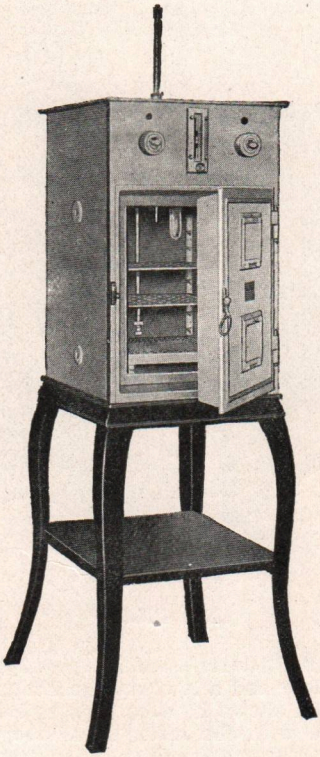
Type 112. 14x17x18-inch chamber, heavy base with legs. Price on application.

4255B **DRYING OVEN,** Electric, Freas, Type R S. Equipped with revolving shelf, according to Mr. Roy O. Fitch, of the Bureau of Standards, Washington, D. C. Consists of Oven No. 2215, Oven Type 100. Interior of chamber 12x12x12 inches, which is fitted with a perforated cast aluminum shelf 10 inches in diameter. This shelf is revolved in the chamber by means of a motor equipment as shown in illustration. This arrangement subjects the various samples to be tested, which are placed on the revolving shelf, to the same uniform constant temperature conditions.

Type A. For 110 volt D. C. Price on application.

Type B. For 110 volt A. C. Price on application.

DRYING OVENS



No. 4256A

EXTRA PARTS FOR FREAS APPARATUS

4256A The Freas Ovens are ruggedly constructed and repair parts will rarely be required. If, however, new parts are desired, they can be easily and quickly obtained. We give below a partial list with code-words if ordered separately.

Prices on application.

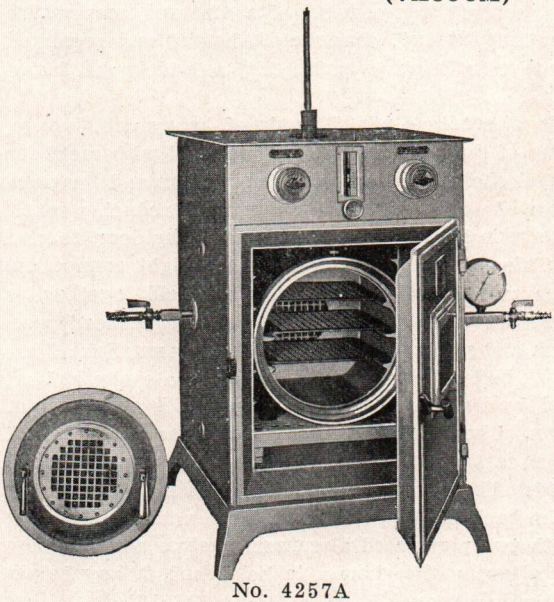
PARTS

Regular Thermometer.
High Temperature Thermometer.
Heating Plate for Nos. 100, 101, 102, RS or RV.
Heating Plate for Nos. 108 and 109.
Heating Plate for No. 110.
Heating Plate for No. 136.
Heating Plate for No. 140.
Heating Plate for No. 104.
Heating Plate for No. 114.
Heating Plate for LV Oven.
Contact Points.

There are also a number of special forms of Freas Apparatus for which the demand has not yet become sufficiently great to justify us, under present conditions, in arranging for the special work which their manufacture involves. Among these special forms we may mention the following: Frea Rotary Swirl Oven, Freas Rotary Oven for Bottles, Freeas Autoclave Ovens, and Freas Tank Thermostat.

VACUUM OVENS

FREAS ELECTRIC OVEN, TYPE V (VACUUM)



No. 4257A

4257A The Freas Electric Oven was designed to meet the demand for a really satisfactory vacuum oven. This demand has been created by the rapidly growing recognition of the advantages of drying in vacuo, thus permitting most drying operations to be conducted more satisfactorily than ever in an air oven and in many instances in a fraction of the time.

Moisture test of flour can be made in a Freas Vacuum Oven at 75° C., in from four to five hours, while in an ordinary Oven 100° C., and from ten to twelve hours are required. Moreover, when making the test at 100° C., there is great danger of charring, and therefore of spoiling the test.

These same conditions apply for organic tests in general; whether for fertilizer, where tests muct be made at the lowest possible temperature to avoid driving off nitrogen compounds, or for powder, where the same conditions apply, along with the danger of igniting the sample; or for milk, where there is great danger of charring; or for operations involving essential oils; in fact, for practically every organic moisture test, the Vacuum Oven is a great convenience, and in many cases it is an absolute necessity.

These various drying operations can be carried on in the Freas Vacuum Oven at any desired temperature up to 180° C., with practically no attention on the part of the operator. It is thoroughly reliable for long, continuous, unattended operations.

Some work can be carried on to advantage in an atmosphere of hydrogen, nitrogen, carbon dioxid, or other gas. In such cases it is only necessary to pass a current of the desired gases through the vacuum chamber. However, where there is any gas pressure, certain special attachments are required.

An exclusive feature of the Freas Small Oven is that the vacuum chamber can be easily removed, allowing the Oven proper to be ued as a regular Drying Oven when vacuum drying is not needed.

Each Oven is supplied with a high grade thermometer of special design and long stem, on which the graduations are etched to 200° C.

When ordering Freas Vacuum Ovens, be sure to specify voltage of your current.

4257A Small. Size of oven chamber: Width, 12 in.; length, 12 in.; height, 12 in. Size of vacuum C., 9x9x9 inch. Prices on application.

4257B Large. Size of oven chamber: Width, 12 in.; length, 28 in.; height, 12 in. Size of vacuum C., 8x28x8 inch. Prices on application.

When ordering Freas Vacuum Ovens, be sure to specify voltage of your current.

VACUUM OVENS

SPECIFICATIONS, TYPE RV VACUUM OVEN

4258A The Freas Type RV Vacuum Oven consists of a constant temperature Electric Oven, inside dimensions 12"x12"x12", constructed, heated and regulated upon the same principles as the regular Freas Oven No. 100, so widely and favorably known.

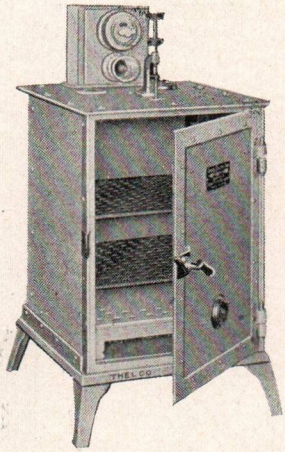
The vacuum chamber, inside dimensions 9"x9", made of heavy cast bronze, is firmly supported in the chamber of the oven proper, and provided with racks for shelves; also four perforated metal shelves, connections for vacuum and for passing through the chamber a stream of warm air, hydrogen or other reducing gases. The front, on which rests the door, is heavily re-enforced, as is the door, to give a substantial bearing surface. This produces a perfect vacuum-tight connection. The ground surfaces of the vacuum chamber and its door are held together by sturdy spring clips until the vacuum pump is started. Then the reduced pressure holds the door in a very firm and air-tight condition. This consruction allows instant removal of the door and permits the bearing surfaces to be easily and accurately reground in case of need, by simply revolving the door, with assistance of the two handles provided thereon. The central part of the door and the back of the chamber is constructed of a cast grid, on which rests a mica plate, made vacuum-tight with its frame—this allows inspection of the vacuum chamber by means of the electric lamp at the back of the oven beyond the vacuum chamber. The oven proper is provided with two perforated aluminum shelves and is equipped with cast aluminum racks, allowing the shelves to be placed at any height desired when the vacuum chamber is removed.

RV Oven, complete. Prices on application.

Chamber only. Prices on application.

FREAS ELECTRIC VACUUM OVEN, LARGE SIZE, TYPE LV

4258B The Freas Large Size Vacuum Oven consists of a rectangular constant temperature Electric Oven, inside dimensions 12"x12"x28" long, outside, 16"x23"x32", heated and regulated on the same principle as the regular Freas Oven. The Oven chamber is fitted with cast bronze vacuum chamber, inside dimensions 8"x8"x18" long, properly supported, and provided with connections for vacuum and for passing in a stream of hydrogen or other gas. The body of the chamber is square, with rounded corners. The front, on which fits the door, is cast circular, heavily reinforced, as is the door, to give a substantial bearing surface, which produces a perfect vacuum-tight connection. The door can be rotated in a swivel holder, which swings on the hinges; this permits of these bearing surfaces being easily and accurately ground in case of need. The central part of the door and the back of the chambed, like the RV Oven, is constructed of a cast grid, on which rests a mica plate made vacuum-tight with its frame—this permits inspection of the chamber by means of the electric lamp at the back of the Oven beyond the vacuum chamber. The vacuum chamber is provided with cast ribs on the sides to accommodate up to ten shelves—six shelves are furnished. This Oven is the one regularly used in large fertilizer, food, powder, and similar laboratories. Its substantial construction, comparatively large size, and satisfactory operation, make it the standard Vacuum Oven. Price on application.



No. 4259A

VARSITY OR THELCO ELECTRIC DRYING OVEN OR STERILIZER

This well known, low price, Oven or Sterilizer, is built of asbestos transite with cast aluminum frame, door and shelf racks. The base is of cast iron of substantial design. The Oven is finished inside and out with acid fume-proof mineral paint, presenting a neat and clean appearance.

The heating element is removable, and covers the bottom of the Oven, as shown in the illustration. It is made of asbestos transite, wound with a special reistance wire.

The Bimetallic Thermostat will maintain any desired temperature between that of the room and 150° C. This range of constant temperature adapts the Oven to a wide variety of work.

The contact points are placed on the outside. This eliminates danger of ignition when drying residues, which give off ether or other inflammable gas.

A switch is provided to turn the current "on" and "off," and a pilot lamp outside the Oven enables the operator quickly to adjust the regulator to any desired temperature. This adjustment is made without opening the door.

Adjustable ventilators are provided in the top and the door, also an opening in the top for the thermometer. Each Oven is supplied with two shelves, adjustable as to height, and with detachable cord and plug.

To place the Oven in use it is only necessary to attach the plug, turn on the current, and when the Oven reaches a temperature desired, adjust the regulator.

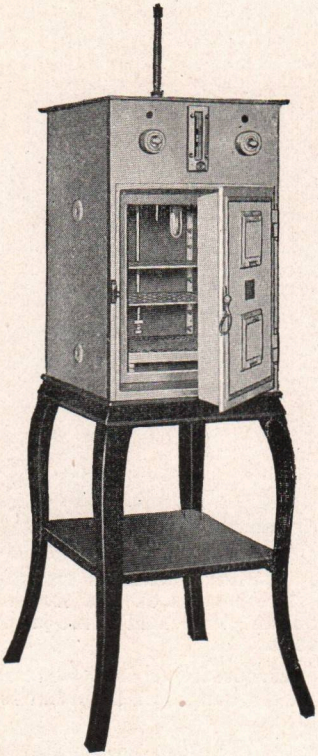
Varsity Ovens are used for a great variety of college work, and elsewhere where continuous operation is not required. They have been practically adopted as the standard apparatus for testing aircraft materials.

Type 4836, Varsity or Thelco Ovens. Prices on application.

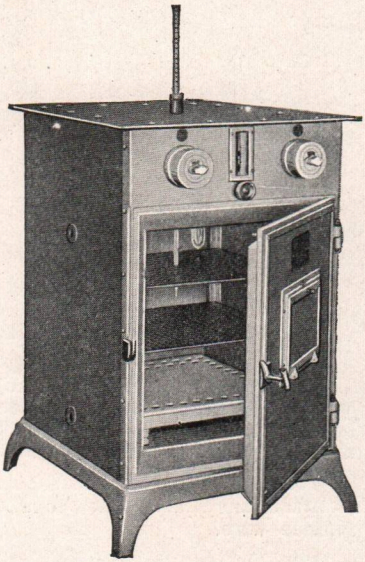
4259A Small. Inside dimensions, 10x10x12 inches high.

4259B Large. Inside dimensions, 18x12x14 inches high.

STERILIZERS



No. 4260C



No. 4260A

FREAS ELECTRIC STERILIZERS

The general construction, regulation, heating, and range of temperature of the Freas Electric Dry Sterilizer are the same as for the Freas Electric Ovens.

Each Sterilizer is supplied with a flexible cord and plug to fit the ordinary lighting circuit, and with a high grade thermometer of special design and long stem on which the graduations are etched to 200° C.

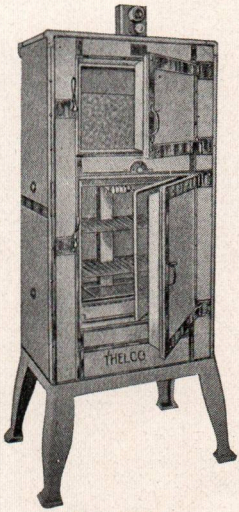
4260A Type 66. 12x12x12-inch chamber, iron base to stand on table.
4260B Type 67. 12x12x12-inch chamber, iron base to stand on table.
4260C Type 70. 14x17x18-inch chamber, heavy base, with legs.
4260D Type 71. 14x17x18-inch chamber, heavy base, with legs.
Prices on application.

Sterilizers No. 67 and 71 are provided with a removable inside glass door and a low wattage heating plate, in addition to the regular heating plate.

When equipped with the inside glass door and the low wattage heating plate, the Sterilizer may be used as a Freas Incubator, with a range of temperature from that of the room to 70° C.

BACTERIOLOGICAL INCUBATOR

THE THELCO "LOW TEMP" INCUBATOR



No. 4261A

The walls of the Thelco "Low Tepm" Incubator are composed on ten distinct layers of wood, porcelain, impervious sheeting, dead air spaces and wool felt.

The outside covering is of porcelain, with aluminum trimmings around the doors, edges and corners, as shown in the illustration.

The porcelain used is of the highest grade fused on steel. It will not mark or crack and can be kept clean with a moist cloth. This gives an Incubator of durable construction and most approved sanitary type, with the best insulating qualities.

The Incubator contains two chambers—an upper for ice and a lower for the water-jacketed working compartment. Each chamber has its own outside door.

The ice chamber is one-piece porcelain lined, and is equipped with a heavy galvanized ice rack. The capacity of this chamber is about 75 pounds of ice. This will last several days in a warm laboratory.

The door locks of the ice and lower chambers are of special design, and hold the doors closed with a constant pressure. This excludes all possibility of the escape of cold air or of warm when the Incubator is used for warm incubation.

The lower chambere communicates with the ice chamber above by an elliptical-shaped opening, with a long collar, the structural arrangements of which are covered by patent. This opening insures the delivery of the cold air from the ice chamber.

The electric heating element, or plate, covers the bottom of the lower chamber and is removable. This heating element is made of asbestos transite, wound with a special resistance wire. It can be depended upon to run indefinitely without attention.

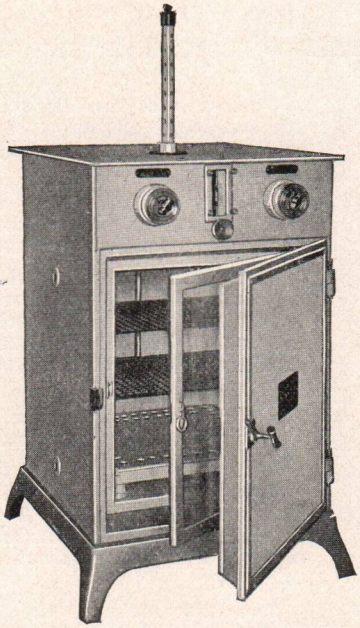
The working compartment is placed within the lower chamber directly on the heating element. It is a heavy triple-walled copper jacket. The space between the walls is filled with water, and the arrangement is such that while in use the water is in constant circulation. A constant water-level attachment is placed on the outside of the Incubator, so the water in the walls of the copper jacket is automatically kept at a constant level.

The Thelco "Low Temp" Incubator was designed to meet the demand for a means of gelatine culture at 20° C.

However, it will work just as efficiently at any predetermined temperature from 10° C. to 40° C., or at less than 10° C., by the use of cooling mixtures. This wide range of temperature, also the ease of obtaining any point between, adapts the Incubaor particularly to the needs of botanical and commercial laboratories, where at times they have work that demands widely different constant temperatures.

4261A Price on application.

INCUBATORS



No. 4262A

FREAS ELECTRIC INCUBATOR

The Freas Electric Incubator has the same general construction, regulation, and heating arrangement as the Freas Electric Oven.

The range of temperature is from that of the room to about 70° C. On account of the low temperature maintained, a low wattage heating plate is used, and the accuracy or regulation is much greater than in a Freas Oven.

The interior is fitted with aluminum racks, allowing the perforated metal shelves to be placed at any desired height. There is provided an inner door of heavy glass, fitted in an aluminum frame, cushioned with felt to exclude the air. This permits inspection of the chamber without opening the door and cooling the incubating chamber. An opening through the top of the Incubator to the chamber is provided for a thermometer. Two snap switches are provided, one for the current, and the other for the lamp illuminating the chamber.

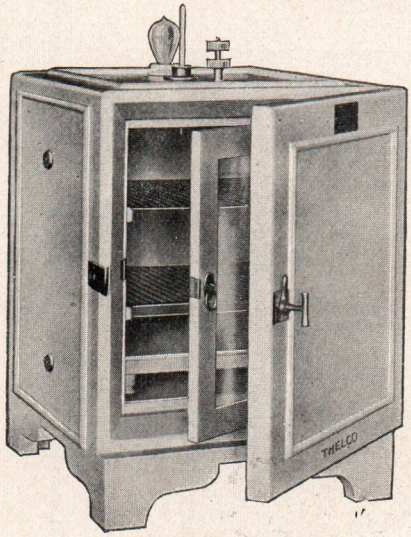
Each Incubator is supplied with a flexible cord and plug to fit the ordinary lighting circuit, and a high grade thermometer of special design with graduations to 70° C.

4262A	Type 26.	12x12x12-inch chamber, iron base to stand on table.
4262B	Type 28.	16x14x16-inch chamber, heavy base with legs.
4262C	Type 32.	18x16x20-inch chamber, heavy base with legs.
4262D	Type 36.	26x14x22-inch chamber, heavy base with legs.
4262E	Type 40.	40x18x25-inch chamber, heavy base with legs.

Prices on application.

Incubators No. 36 and No. 40, if desired for use with large receptacles, can be furnished (at no extra cost) without the center column of the door-frame, with the divided door matching in the center.

BACTERIOLOGICAL INCUBATOR



No. 4263A

THE NEW THELCO BACTERIOLOGICAL INCUBATOR

The new Thelco Bacteriological Incubator is of improved construction. The inside walls, top and bottom, are of asbestos transite. The outer walls and top are of a washable, high grade insulating material. The space between the inner asbestos walls and the outer walls is filled with air-cell insulation.

The outside finish is white laboratory enamel, which can be kept clean with a moist cloth.

An inner glass door is provided to allow inspection of contents without exposing them to the cold outer air.

The heating element is removable and covers the bottom of the chamber, as shown in cut. This heating element, being made of asbestos transite and wound with a special resistance wire, cannot get out of order or burn out, thus cannot cause accidental loss of cultures.

The Thelco Bimetallic Thermostat, the control element, will maintain the temperature to within a half degree of that desired, giving a range of temperature from that of the surrounding atmosphere to the capacity of the heating element used.

A pilot lamp is fitted outside the Incubator to enable the operator to adjust quickly the regulator to the desired temperature. This adjustment is made without opening the Incubator.

The Incubator is equipped with detachable cord and plug for attachment to regular electric light socket, also with shelves adjustable as to height. No. 2 has one shelf, and Nos. 4 to 7 two each.

The two large size Incubators can be furnished with angle iron stand finished in white Laboratory Enamel.

To place the Incubator in use, screw the attarhment plug into an electric light socket, turn on the current, and adjust the regulator when the Incubator reaches the temperature desired, after which it will remain constant to within a half degree.

When ordering Thelco Incubators, be sure to specify voltage of your current.

4263A	Type	2.	12x12x12-inch chamber, without stand.
4263B	Type	4.	18x18x26-inch chamber, without stand.
4263C	Type	5.	18x18x26-inch stand, with stand.
4263D	Type	*6.	36x18x28-inch chamber, without stand.
4263E	Type	*7.	38x18x28-inch chamber, with stand.

*Nos. 6 and 7 are made with double divided doors.

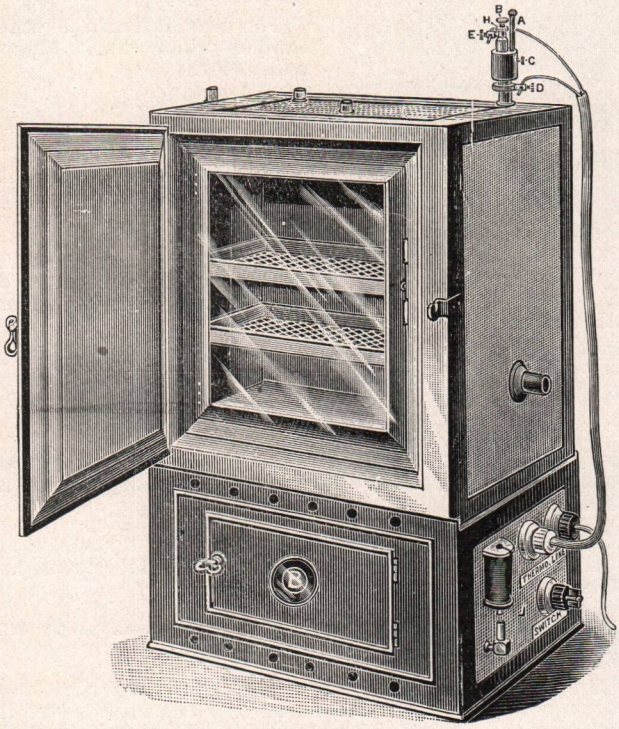
Prices on application.

BACTERIOLOGICAL INCUBATORS

TRIPLE WALL WITH NEW ELECTRIC HEATING AND CONTROLLING DEVICE

CAN BE USED ON DIRECT OR ALTERNATING CURRENT

PATENTED



No. 4264A

This is not only something different from those on the market, but a positively new idea for regulating electrically heated incubators, ovens and other apparatus.

After thorough and careful experimenting we now list our Incubators of the various sizes with electric heating and controlling device.

BACTERIOLOGICAL INCUBATORS

TRIPLE WALL. ELECTRICALLY HEATED.

Our Electrically Heated Apparatus will be found very convenient and satisfactory. The Incubators proper are constructed in the usual manner, our standard, and if at any time it should be desired to use the same with gas, the Electric attachment may be readily removed.

The entire Apparatus is compact and operates on the main current without any further attachment, it only being necessary to insert socket and turn on current; there are no exposed terminals.

A Regulator that Regulates! This device is so simple and practically constructed that its mode of operation is easily comprehended. When once set at the degree of heat desired requires no further attention; for instance, if set at 37½° Ceelcius, there will hardly be a noticeable variation in temperature. Operating by expanded mercury positively assures the finest adjustment.

We are in a position to furnish Incubators, Sterilizers, Ovens and Digesting Apparatus, etc., with Electric Equipment.

Before shipment each Incubator is thoroughly tested to maintain a constant temperature.

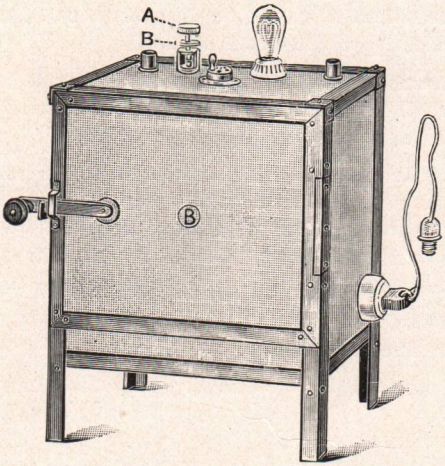
PRICES

			Inside Dimensions		Each
4265A	Electric Incubator	Type 1270a	9 x 7x 7	inches	$ 90.00
4265B	Electric Incubator	Type 1272a	12 x 9x 9	inches	115.00
4265C	Electric Incubator	Type 1274a	9½x12x 9½	inches	130.00
4265D	Electric Incubator	Type 1275a	14 x12x10	inches	135.00
4265E	Electric Incubator	Type 1276a	19 x12x10	inches	155.00
4265F	Electric Incubator	Type 1277a	20 x18x10	inches	175.00
4265G	Electric Incubator	Type 1280a	12 x 9x 9	inches	120.00
4265H	Electric Incubator	Type 1285a	18 x18x12	inches	190.00
4265I	Electric Incubator	Type 1286a	28 x18x14	inches	235.00
4265J	Electric Incubator	Type 1290a	18 x30x14	inches	260.00
4265K	Electric Incubator	Type 1295a	25 x30x18	inches	310.00

In ordering it is necessary to state voltage.

ELECTRIC HOT AIR OVEN

WITH AUTOMATIC CONTROL



No. 4266A

HOT AIR OVEN, constructed of Asbestos Board, and with heavy brass binding finished in keeping with our regular standard apparatus. The regulation is positive and the control within one degree. The range at which the Oven can be used is from 50 degrees to 200 degrees Celcius. Consumption is 5 amperes. Can be used with ordinary socket on either alternating or direct current. A feature is that the contact points are outside the Oven. This eliminates any possible danger when using a combustible substance.

Heating units are independent and can be renewed, but this will hardly be necessary so long as ordinary care is taken of the Oven.

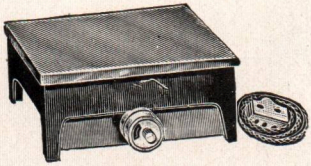
Electrical heat does not require draft. In fact, these changes are detrimental to all heating units. Proper ventilation at the top is all that is necessary.

4266A **HOT AIR OVEN,** Electric, for 110 volts, either direct or alternating current, size 10x10x12 inches wide, with 6 feet cord and plug.

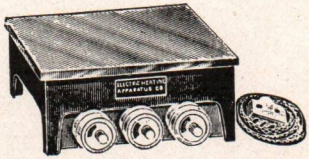
Can lso be furnished for 220 volts. Type 1078.

Price, each $50.00

PLATES

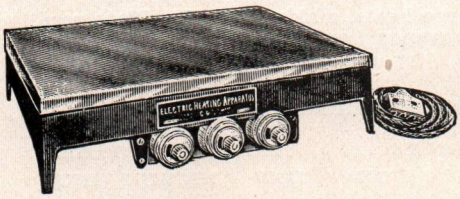


No. 4267A

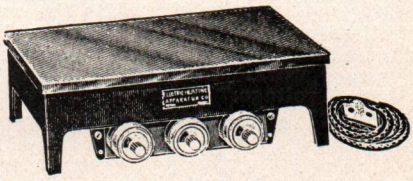


No. 4267B

4267A	Single Heat on 110 or 220 volts. Two Heats on 110 volts, with "Shifted Voltage." One switch, mounted. Type 10. Each	$35.00
4267B	Two units per set, for above	5.00
4267C	Three Heats on 110 or 220 volts. Six Heats on 110 volts with "Shifted Voltage." Type 12. Each	37.00
4267D	Three switches mounted, 2 units per set, for above	5.00
4267E	Three Heats on 110 or 220 volts. Six Heats on 110 volts with "Shifted Voltage." Three switches mounted on 18-inch edge. Type 22. Each	54.00
4267F	Same as Type 22, except switches are mounted on 12¼-inch edge. Type 20. Each	54.00
4267G	Single Heat on 110 or 220 volts. Two Heats on 110 volts with "Shifted Voltage." Has no switch nor switchboard. Type 24. Each	50.00
4267H	Two units per set, for above	6.25



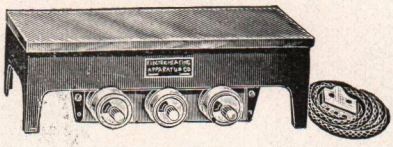
No. 4267F



No. 4267I

4267I	Three Heats on 110 or 220 volts. Six Heats with "Shifted Voltage." Three switches mounted on 24-inch edge. Type 32. Each	$82.00
4267J	Same as Type 32 except switches are mounted on 18-inch edge. Type 30. Each	82.00
4267K	Single Heat on 110 or 220 volts. Two Heats with "Shifted Voltage." Has no switch nor switchboard. Type 34. Each	75.00
4267L	Four units per set each for above	6.25
4267M	Three Heats on 110 or 220 volts. Six Heats on 110 volts, with "Shifted Voltage." Three switches mounted. Type 40. Each	32.00
4267N	Single Heat on 110 or 220 volts. Two Heats on 110 volts with "Shifted Voltage." One switch (center one of three) instead of three. Type 42. Each	30.00
4267O	Two units per set each for above	4.25

PLATES



No. 4268A

PLATES, HOT, MULTIPLE UNIT—Multiple-Unit Hot Plates give temperatures twenty-five per cent. higher than other makes with equivalent current; give the same tempereatures with thirty per cent. less current. The units are readily renewable by the operator.

CAST IRON BASES AND TOPS. Top Plate, polished surface. Top Plate rests on the units, free from contact with the base, which obviates the loss of heat by conduction. The units rest on bricks of low thermal conductivity, having a conductivity of about one-tenth that of ordinary fire bricks. This forces to the top of the plate a maximum amount of heat generated and affords a comparatively cool atmosphere to the under side of the apparatus. The increeased efficiency is a net saving in current cost; gives higher temperatures and quicner maximum heats.

All sizes, whether of the Three heat or Single-heat type, give maximum temperatures of at least 750° F. (400° C.) The Three-heat type gives approximateely 400° F. (205° C.) on low heat and 600° F. (315° C.) on medium heat, when useed on 110 or 220 volts.

When used on "Shifted voltages" the Three-heat type gives three additional heats of approximately 160° F. (71° C.), 240° F. (116° C.) 360° F. (182° C.).

When the Three-heat Hot Plate is used on 110 volts, the connector plug at the rear may be shifted to the connector pins designeed for 220 volts. This "shifted voltage" gives an additional three heats, making the Hot Plate readily adaptable for alcohol extractions, ether evaporations and such similar low temperature work. Similarly, the one-heat type gives two heats when used on "shifted voltage."

WEIGHTS, TEMPERATURES, CURRENT CONSUMED.

TYPE	SIZE IN INCHES	WEIGHT LBS. NET	WEIGHT LBS. BOXED	110 OR 220 VOLTS						"SHIFTED VOLTAGE"					
				LOW		MEDIUM		HIGH		LOW		MEDIUM		HIGH	
				Degrees F.	Watts	Degrees F.	Watts	Degrees F.	Watts	Degrees F.	Watts	Degrees F.	Watts	Degrees F.	Watts
12	12¼x12¼	32	51	400	352	600	704	750	1056	160	94	240	187	360	275
22	12¼x18	50	80	400	520	600	1030	750	1550	160	145	240	290	360	435
32	18x24	82	135	400	1070	600	2140	750	3200	160	275	240	550	360	825
40	6½x18	28	45	400	285	600	570	750	860	160	75	240	150	360	225

PLATES, HOT ELECTRIC, MULTIPLE UNIT

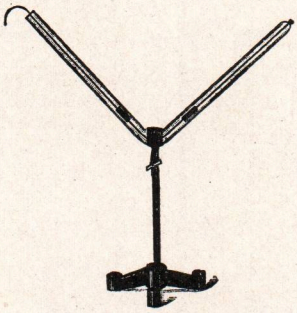
4268A	Type 12, size 12¼x12¼	each	$37.50
4268B	Type 22, size 12¼x18	each	54.00
4268C	Type 32, size 18 x24	each	82.50
4268D	Type 40, size 6½x18	each	32.25

RENEWAL PARTS. The serial number and voltage must be given when ordering renewals.

4268F	Type 22 (2 per plate)	per unit	6.50
4268G	Type 32 (4 per plate)	per unit	6.50
4268H	Type 40 (2 per plate)	per unit	4.35

ELECTROLYTIC APPARATUS

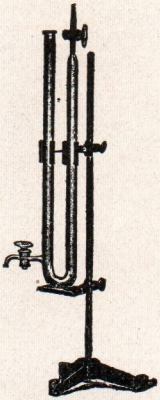
No. 4269A



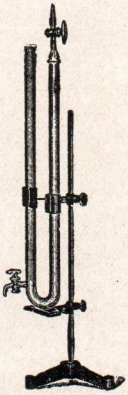
No. 4269B

4269A **HOFFMAN'S APPARATUS.** For electrolysis of water, gases collected in separate graduated tubes. Price on application.

4269B **HOFFMAN'S APPARATUS.** For electrolytic decomposition of water, hydrochloric acid and ammonia. Price on application.
Glass part only. Price on application.



No. 4269C

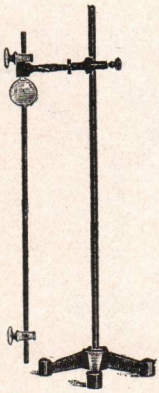


No. 4269D

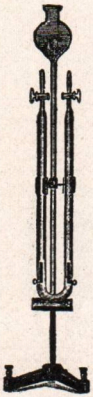
4269C **HOFFMAN'S APPARATUS.** For determining the volume of hydrogen in hydrochloric acid. Price on application.
Glass part only. Price on application.

4269D **HOFFMAN'S APPARATUS.** For demonstrating that three volumes of hydrogen united with one volume of nitrogen form two volumes of ammonia. Price on application.
Glass part only. Price on application.

ELECTROLYTIC APPARATUS



No. 4270A

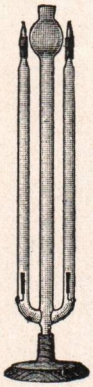


No. 4270B

4270A **HOFFMAN'S APPARATUS.** For demonstrating that one volume of H. united with one volume of CL. to form two volumes of HCL. without alteration in volume. Price on application.
Glass part only for same. Price on application.

4270B **HOFFMAN'S APPARATUS.** For decomposition of water, demonstrating that water is composed of two volumes hydrogen and one volume oxygen. Price on application.
Glass part only for same. Price on application.

4270C Same as above with graduated tubes, mounted. Price on application.
Glass part only for same. Price on application.



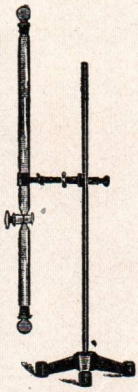
No. 4270D

4270D **HOFFMAN'S APPARATUS...** For decomposition of water on wooden support, 18 inches high. Price on application.

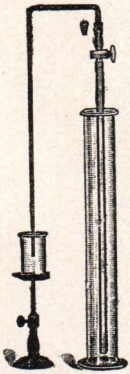
4270E **HOFFMAN'S APPARATUS.** To demonstrate that hydrogen combines with oxygen only in the proportions in which it is liberated from water by electrolysis. Tubes with two stopcocks.
Tubes with one stopcock.
Supports.

Prices on above on application.

ELECTROLYTIC APPARATUS



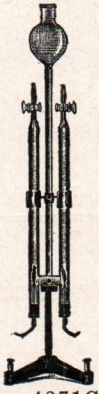
No. 4271A



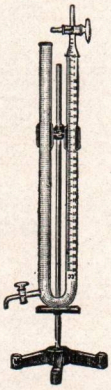
No. 4271B

4271A **HOFFMAN'S APPARATUS.** To prove the invariability of combination by volume between hydrogen and chlorine in hydrochloric acid.
Complete $4.00
Tubes only 2.50

4271B **HOFFMAN'S APPARATUS.** To prove that ammonia consists of one part nitrogen and three parts hydrogen.
Complete on support 9.00



No. 4271C



No. 4271D

4271C **HOFFMAN'S APPARATUS.** For decomposing of water, hydrochloric acid and ammonia. Tubes with platinum electrodes $6.00
Tubes with carbon electrodes 6.00
Supports 3.00

4271D **HOFFMAN'S APPARATUS.** Eudiometer, for lecture table use.
Complete with support 9.00
Glass part only 6.00

4271E **EMERY CLOTH.** Per sheet ..... .10

4271F **EMERY PAPER.** Per sheet ..... .08

ENVELOPES. See paper.

EXTRACTION APPARATUS

No. 4272A

No. 4272B

No. 4272C

No. 4272D

4272A **EXTRACTION APPARATUS—SOXHLET;** complete, consisting of Bulb Condenser, Soxhlet Extraction Tube, wide mouth Perfection Flask and fine grain cork stopper. Type 7375.

Inside diameter of Soxhlet Tube, m/m...	30	38	50
Each	$4.90	5.25	6.75

4272B **EXTRACTION APPARATUS—SOXHLET;** same as Type 7375 but with ground joints instead of cork stoppers; each apparatus is furnished with three Perfection Glass Flasks, ground to fit extraction tube. Type 7380.

Inside diameter of Soxhlet Tube, m/m.....	30	38	50
Each	$6.75	7.50	9.00

4272C **EXTRACTION APPARATUS—SOXHLET;** same as Type 7380, with ground joints throughout, but with Hopkins' Condenser in place of bulb condensers, with three Perfection Glass Flasks ground to fit. Type 7385.

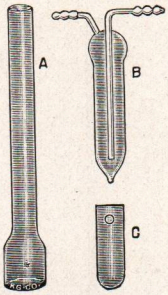
Inside diameter of Soxhlet Tube, m/m.....	30	38	50
Each	$7.50	8.25	9.75

4272D **EXTRACTION APPARATUS—SOXHLET;** consisting of Soxhlet Tube, 38 m/m inside diameter, Hopkins' Condenser and Knorr Flasks; 100 cc. for Mercury Seal, joint between condenser and extraction tube is ground air-tight. Type 7390. Each 9.00

EXTRACTION APPARATUS

No. 4273A

No. 4273B



No. 4273C

4273A **EXTRACTION APPARATUS—KNORR;** complete with Condenser, Extraction Tube and Knorr Flask, glass parts only, see U. S. Department of Agriculture Bureau of Chemistry circular No. 69, Walter and Goodrich Improvement in the Knorr Extraction Apparatus. Type 7395. Each.... $9.80

4273B **EXTRACTION APPARATUS—RINGER;** with Hopkin's Condenser and Extraction Apparatus well suited for continuous extraction from liquid media. All joints ground airtight. Inside diameter of extraction tube, 38 m/m; length, 37 c/m; complete with three Perfection Flasks ground to fit. Type 7400. Each..... 12.00

4273C **EXTRACTION APPARATUS**—As used in the food laboratories, Bureau of Chemistry, U. S. Department of Agriculture. Consists of cylinder, condenser and glass thimble. Outfit complete. Type 7405. Each 5.30

4273D **A— A CYLINDER** for above, 20½ inches long, 2 inches diameter, except at its lower or sealed end, which is enlarged to a diameter of 3 inches for a length of 4 inches. Each.... 2.30

4273E **B—CONDENSER** for above, 1¾ inches diameter except at its upper end, which is enlarged to a bulb 2¼ inches in diameter to permit its suspension in "A." Each 2.25

4273F **C—THIMBLES** for above, 6 inches long and 1½ inches in diameter, perforated ¼ inch from top, with two ¼-inch holes placed opposite each other; capacity, 100 cc with straight upper rim. Each ..... .75

EUDIOMETERS

No. 4274A

No. 4274C

No. 4274D

4274A **EUDIOMETERS—BUNSEN'S**; with platinum electrodes. Type 7355.

Capacity, cc	50	50	100	200
Graduated into	1/5	1/10	1/5	1/5
Each	$3.00	3.50	4.25	5.25

4274B **EUDIOMETERS—BUNSEN'S**; sace style as Type 7355, graduated in millimeters. Type 7360.

Graduated to m/m	300	500	800
Each	$4.00	4.75	5.50

4274C **EUDIOMETERS—URE'S**; with platinum electrodes. Type 7365.

Capacity, cc	50	100
Graduated into	1/5	1/5
Each	$3.50	4.00

4274D **EUDIOMETERS—MITCHERLICH'S**; with glass stopcock and platinum electrodes. Type 7370.

Capacity, cc	50	100
Graduated into	1/5	1/5
Each	$5.25	6.40

FILTER PAPER

No. 4275A

4275A **FILTERS STANDARD GRAY**—Cut in circles. Very rapid filtering.

Diameter	4	5	6	7	8	10	13	15	18	20	24	26
Per 100 circles	$.11	.15	.18	.24	.30	.42	.75	1.00	1.30	1.60	2.50	3.00

20x20 inches—50x50 CM. $ 6.90 per ream of 500 sheets.
24x24 inches—60x60 CM. $10.50 per ream of 500 sheets.

No. 4275B

LION

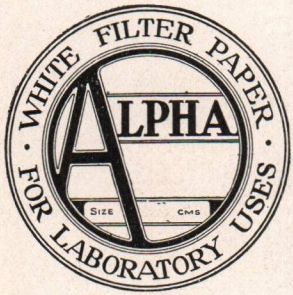
4275B A heavy, strong rapid filtering paper, of medium texture, with creped surface.

Very popular—in the large sizes in particuluar—among Manufacturers of Pharmaceuticals, for Extracts, Essences, etc., Manufacturers of Chemicals, Biologicals, Perfumes, etc., also for filtering Soap solutions, Oils, etc.

Diameter, in...	3½	4⅜	5	6	8	10	13	15	18	20	24	26
Per 100 circles	$.15	.18	.22	.30	.46	.75	1.20	1.55	2.20	2.65	3.80	4.40

20x20 inches—50x50 CM. $12.60 per ream of 500 sheets.
24x24 inches—60x60 CM. $18.35 per ream of 500 sheets.

FILTER PAPER



4276A **ALPHA**—A smooth surface, high grade white paper of close texture. Recommended for purposes requiring a very retentive paper. Widely used for students 'requirements in Schools and Colleges, by Physicians in urinary analysis, etc., also by Manufacturing Chemists and Pharmacists, etc., for purposes requiring a very retentive paper.

No. 4276A

Diameter, in.	3	3½	4	5	6	7	8	10	13	15	18	20
Per 100 circles	$.10	.11	.12	.17	.20	.27	.35	.50	.80	1.15	1.50	1.85

20x20 inches—50x50 CM. $ 8.50 per ream of 500 sheets.
24x24 inches—60x60 CM. $12.25 per ream of 500 sheets.

4276B **CLIMAX**—A high grade paper, of texture similar to ALPHA, but with creped surface, therefore more rapid filtering. This grade is extensively employed for general filtering purposes requiring a retentive paper.

No. 4276B

Diameter, in.	3	4	5	6	7	8	10	13	15	18	20
Per 100 circles	$.10	.12	.17	.20	.27	.35	.50	.80	1.15	1.50	1.85

20x20 inches—50x50 CM. $ 8.50 per ream of 500 sheets.
24x24 inches—60x60 CM. $12.25 per ream of 500 sheets.

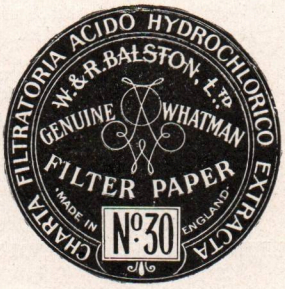
4276C **EABLE BRAND FOLDED**—For rapid filtration these Folded Filters are unequaled. For most purposes, they filter almost three times as fast as ordinary circles. The special method of folding practically eliminates break-at the point. In this and other respects, EAGLE Brand Folded Filters are unequalled. For the larger sizes, a slightly heavier paper is employed than for the smaller sizes.

No. 4276C

Per 100 circles	$ .55	.60	.75	1.20	2.00	2.40	3.60
Diameter, inches	5	6	7	10	13	15	20

4276D **WHATMAN STRIPS**—Type 130. (Unsensitized.) For Arsenic determinations. These strips are made from the highest grade Whatman Paper, of a stout substance so as to insure rigidity. Size 120mm, long by 2½ mm wide. Per box of 1,000 strips $1.25

FILTER PAPER



No. 4277A

WHATMAN'S ENGLISH FILTER PAPER

Made by the Manufacturer of the Well-Known Whatman Drawing Paper

Special Booklet sent upon request, giving in detail the typical applications the different papers are adapted for.

4277A **FILTER PAPER, WHATMAN Type 1.** A high-grade rapid filter for general qualitative work. Corresponds to S&S No. 595 and Munktell's No. 2.

Diameter, cm.	7	9	11	12½	15	18½	24
Per pkg. (100 sheets)	$ .20	.24	.28	.37	.51	.71	1.25

4277B **FILTER PAPER, WHATMAN Type 2.** A qualitative paper similar to No. 1 in its general characteristics but stouter. It retains fine precipitates, filters rapidly and is the standard grade for analytical purposes. Corresponds to S&S No. 597 and Munktell's No. 3.

Diameter, cm.	7	9	11	12½	15	18½	24	27
Per pkg. (100 sheets)	$ .27	.34	.42	.52	.74	1.04	1.78	2.16

4277C **FILTER PAPER, WHATMAN Type 2,** in sheets 23x23 inches.
Per 100 sheets, $8.80 Per ream, $40.00

4277D **FILTER PAPER, WHATMAN Type 3.** Very stout and strong for general qualitative work. It is slightly slower than No. 2, but is very retentive and will withstand considerable washing. Corresponds to S&S No. 598 and Munktell's No. 100.

Diameter, cm.	7	9	11	12½	15	18½
Per pkg. (100 sheets)	$ .40	.50	.57	.74	1.04	1.48

4277E **FILTER PAPER, WHATMAN Type 4.** A soft paper of more open texture than Nos. 1, 2 or 3. Extremely rapid, but not recommended for use with the finest precipitates, for which purpose Nos. 2 or 3 should be employed. Corresponds to S&S No. 604 and Munktell's No. 1F.

Diameter, cm.	7	9	11	12½	15	18½
Per pkg. (100 sheets)	$ .30	.40	.50	.65	.90	1.30

FILTER PAPER

4278A **FILTER PAPER, WHATMAN Type 5.** A very tough, hard paper, close in texture, and will retain the finest precipitates, such as Barium Sulfate and Lead Sulfate, even when freshly precipitated. Corresponds to S&S No. 602.

Diameter, cm.	9	11	12½	15	18½
Per pkg. (100 sheets)	$ .34	41	.54	.75	1.11

4278B **FILTER PAPER, WHATMAN Type 30.** Washed in hydrochloric acid, a rapid and retentive paper of low ash content. Corresponds to Munktell's No. 0.

Diameter, cm.	7	9	11	12½	15	18½
Per pkg. (100 sheets)	$ .68	.90	1.20	1.50	1.90	2.70

4278C **FILTER PAPER, WHATMAN Type 31.** Washed in hydrochloric acid. Similar to No. 30, but more open to texture, making it very rapid; on account of its extreme rapidity it is not recommended for use with the finest precipitates. Corresponds to Munktell's No. 0B.

Diameter, cm.	9	11	12½	15	18½
Per pkg. (100 sheets)	$ .90	1.20	1.50	1.90	2.70

4278D **FILTER PAPER, WHATMAN Type 40.** An ashless paper washed in hydrochloric and hydrofluoric acid. Corresponds to S&S No. 589, White Ribbon.

Diameter, cm.	7	9	11	12½	15	18½
Per pkg. (100 sheets)	$1.20	1.70	2.00	2.30	2.70	3.60

4278E **FILTER PAPER, WHATMAN Type 41.** Similar to the No. 40, but more open in texture, therefore filtering more rapidly. Corresponds to S&S No. 589 Black Ribbon.

Diameter, cm.	7	9	11	12½	15	18½
Per pkg. (100 sheets)	$1.20	1.70	2.00	2.30	2.70	3.60

4278F **FILTER PAPER, WHATMAN Type 42.** Similar in its chemical qualities to Nos. 40 and 41, but differing in physical properties, being much harder and extremely close in texture, slower in filtration than No. 40, therefore recommended for use preferably with vacuum. Corresponds to S&S No. 589 Blue Ribbon.

Diameter, cm.	7	9	11	12½	15	18½
Per pkg. (100 sheets)	$1.20	1.70	2.00	2.30	2.70	3.60

4278G **FILTER PAPER, WHATMAN Type 44.** Washed in hydrochloric and hydrofluoric acid, of thinner substance than No. 40 and the ash content lower. It will retain the finest precipitates, but is slightly slower in filtration than No. 40. Corresponds to S&S No. 590 and Munktell's No. 00.

Diameter, cm.	7	9	11	12½	15
Per pkg. (100 sheets)	$1.50	2.20	2.55	2.80	3.60

4278H **FILTER PAPER, WHATMAN Type 50.** Very tough, being specially hardened by treatment with nitric acid. Will resist great pressure and retain the finest precipitates. Can be used repeatedly, the hard smooth surface admitting of precipitates being scraped or washed off without injury to the paper. Especially recommended for use with vacuum. Corresponds to S&S No. 575.

Diameter, cm.	9	11	12½	15	18½
Per pkg. (100 sheets)	$1.70	2.00	2.30	2.70	3.60
Diameter, cm.	24	32	38½	50	
Per pkg. (100 sheets)	$6.10	11.35	13.75	20.85	

FILTER PAPER

4279A **WASHED FILTERS**—Washed with hydrochloric acid, removing traces or iron, alumina, lime, etc. The ash is reduced to a minimum, and a high standard of purity is secured. A uniform and quick filter, retaining fine precipitates; adapted to the most precise requirements of analytical work. Type O.

In square sheets, 48x48 ctm. per quire.....$7.50

Cut in round filters, 100 filters in a package, five packages in a box of birch bark.

Diameter, ctm.	5.5	7	9	11	12.5	15	18.5
Per 100 filters	$ .60	.81	1.26	1.65	1.89	2.55	3.75

4279B **THE ORIGINAL SWEDISH PAPER**—Of best linen material, most perfect filtering paper made; leaves one-third less ash than formerly the smallest amount of any unwashed paper. Very strong, adapted to the highest class of chemical work. The finest precipitates are retained. Type 1F.

Per ream of 480 sheets; size, 48x48 ctm.....$60.00

Per quire 3.60

Cut in round filters, 100 filters in a package, five packages in a box of birch bark.

Diameter, ctm.	5.5	7	9	11	12.5	15	18.5
Per 100 filters	$ .33	.48	.75	.90	1.20	1.50	2.25

4279C **A PURE WHITE LINEN PAPER OF MEDIUM THICKNESS**—Not as closely made, therefore more rapid in filtration. A superior paper for all laboratory work. Type 2.

Per ream of 480 sheets; size, 48x48 ctm.....$51.00

Per quire 3.00

The same in round fiters, 100 filters in a package, five packages in a box of birch bark.

Diameter, ctm.	5.5	7	9	11	12.5	15	18.5
Per 100 filters	$ .30	.39	.60	.78	.93	1.20	1.59

All of the above named filter papers are put up in the most careful manner, each package of 500 filters being enclosed in a birch box, preventing injury from dust or moisture, and affording a perfect container for it in the laboratory.

4279D **A PURE WHITE PAPER OF SUPERIOR QUALITY**—Heavier than No. 2; filters rapidly. Fully equal to any of the best German papers, but at less cost than any other paper of same quality and weight. Type 3.

Per ream of 480 sheets; size, 48x48 ctm.....$42.00

Per quire 2.40

Also in round filters, 100 filters in a package.

Diameter, ctm.	5.5	7	9	11	12.5	15	18.5
Per 100 filters	$ .24	.30	.45	.54	.72	96	1.23

4279E **EXTRA HEAVY**—This grade is added to supply a heavier and stronger filter for certain solutions. It is of the same quality paper as the above, filters rapidly, and will retain the finest precipitates. Type 100.

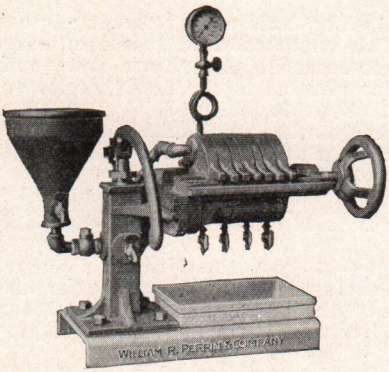
Per ream of 480 sheets; size, 48x48 ctm.....$60.00

Per quire 3.60

The same in round filters, 100 filters in a package.

Diameter, ctm.	5.5	7	9	11	12.5	15	18.5
Per 100 filters	$0.33	.42	.63	.81	.99	1.29	1.65

FILTER PRESS

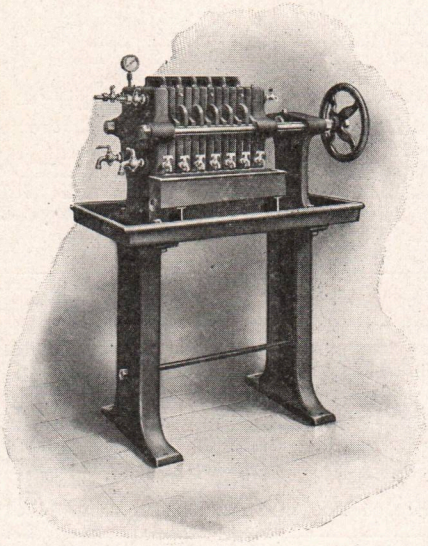


No. 4280A

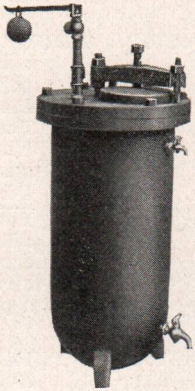
4280A **FILTER PRESS.** Experimental, round pattern. For laboratory use, built to stand a pressure of 150 pounds to the square inch. Made with flat plates and frames, so that filter cloth or paper can be used; of iron, with brass valves fitted to pump; weight, about 125 pounds.

Built of iron..... $ 80.00

Built of brass..... 120.00



No. 4280B



No. 4280D

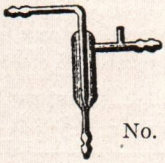
4280B This Laboratory Filter Press is a complete working model of the highest type of filter press. Each plate represents one square foot of filterating area and the chamber has a capacity of one twenty-fourth of a cubic foot. There are six chambers, so that the exposed filtering area is six square feet with a capacity for solids of one quarter cubic foot. It is arranged so that the filtered material may be discharged through internal ports without exposure to air or discharged into an open trough, and it is equipped with ports for absolute washing or extraction. There is supplied with the press, when desired, a specially constructed Montejus for feeding the press, which is much more convenient where compressed air is available.

4280C **FILTER PRESS.** Each..... $145.00

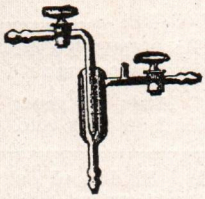
4280D **MONTEJUS.** Each..... 45.00

FILTERING PUMPS

No. 4281G



No. 4281D



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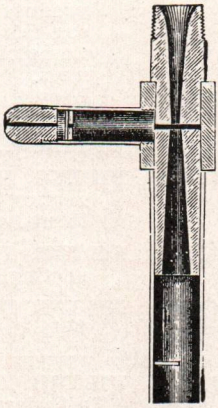


No. 4281B

No. 4281C

No. 4281H

4281A **FILTERING PUMP.** Brass, of new construction, will produce higher vacuum in less time and uses one-third less water than any other filter pump. Complete, with connection 3610. Made in three sizes.

Type Nos.		1752	1753	1754
Length	Inches	3¾	4¾	5⅜
For	I. P. Thread	¼	¼	¼
Prices		$1.60	1.90	2.25

4281G **FILTER PUMP, RICHARD'S.** Improved design, made of brass. With connection 3610 for screwing on water faucet.

Small size, 5 inches with ⅛ inch iron pipe thread $1.90
Large size, 7 inches with ⅜ inch iron pipe thread 2.75
Extra large size, 13 inches with ¾ inch iron pipe thread 8.50

4281B **FILTER PUMPS, CHAPMAN'S.** Made of brass, with connection for screwing on water faucet.

Size	Inches	3¾	4¾	5⅜
Prices		$2.00	2.30	2.70

4281C **FILTER PUMP, CHAPMAN'S,** Couplings for. When ordering, state size of pump for which coupling is desired.

A For threaded faucet ..... $ .40
B For smooth faucet ..... .70

4281D **FILTER PUMP, FISHER'S.** Made of glass and used with water pressure. For rap'd filtration. Without stopcacks $2.25

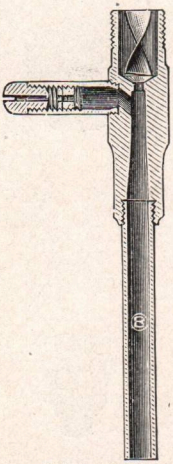
4281E **FILTER PUMP, FISHER'S.** Same as No. 2564, but with two stopcocks $5.00

4281H **FILTER PUMP, RICHARD'S,** Couplings for. When ordering, state size of pump for which coupling is desired.

A For threaded faucet ..... $ .40
B For smooth faucet ..... .70
C For extra large size, for threaded faucet 1.00

4281F **FILTER PUMP, GEISSLER'S.** Of glass 2.00

FILTERING PUMPS



No. 4282A

4282A **FILTER PUMP.** Brass, of new construction, will produce higher vacuum in less time and uses one-third less water than any other filter pump. Complete, with connection 3610. Made in three sizes.

Length ....inches	3 ¾	4 ¾	5 ⅜
For ....I. P. Thread	⅛	¼	¼
Price	$1.60	1.90	2.25

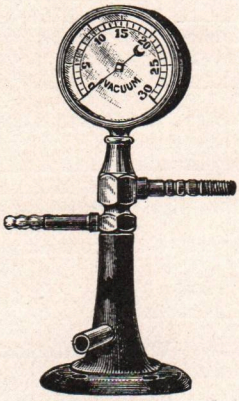
4282B **FILTER PUMP CONNECTION.** For connecting filter pumps to water faucets, furnished separately $0.50

4282C **FILTER PUMP CONNECTION.** For connecting filter pump to smooth faucet .... .75

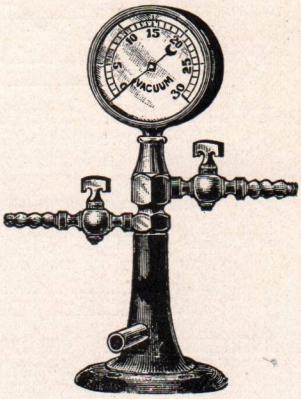
4282D **FILTER BOAT.** Made of sheet nickel, size 3x½ inch. Used in iron and steel analysis .... .75

4282E **FILTER CONE.** Made of sheet nickel, seamless and perforated. Diameter 1½ inches 3.50

4282F **FILTER CONES, ALUNDUM.** See Alundum Ware.
PALAU. See Palau Ware.
PLATINUM. See Platinum Ware.



No. 4282H



No. 4282I

4282G **FILTERING PUMPS.** On base, with vacuum gauge $12.00

4282H **FILTERING PUMPS.** With vacuum gauge, and stopcocks at water and exhaust connections 15.00

4282I **FILTERING PUMPS.** Same as above, without gauge 8.25

4282J **FILTERING PUMPS.**
Small size, 3¾-inch, ⅛-inch I. P. thread 7.00
Medium size, 4¾-inch, ¼-inch I. P. thread 15.00
Large size, 5⅜-inch, ¼-inch I. P. thread 18.00

4282K **FINGER COTS.** Thin .... .75
FINGER COTS. Heavy .... .90

FILTER STANDS. See Supports.
FILTER THIMBLE. See Extraction Cartridges.
FILTER TUBES. See Tubes.

FIRE BRICK AND TILE

No. 4283A

The Fire Brick and Tile which we supply are of the very highest grade clay and the most careful manufacture. The clay is most refractory and so is capable of standing extremely high temperatures. The brick are made by three different processes, each having qualifications rendering it particularly suitable for certain classes of work. It is desirable to inform us fully as to the conditions of use so that the customer can avail himself of the factory's experience nad advice, thus getting material of the right characteristics to fulfill the requirements of the metallurgical operation or other purpose.

The "Hand-Made" Brick is the one to use under the most exacting conditions as it is free of laminations and stand abrasion well, besides being the most refractory. Shapees can be supplied in this brand.

The "Stiff-Mud" Brick, made by the machine process, are straight and true to form, will lay up well with close joints and, being hard burned, stand abrasion well. All shapes of standard 9″ brick are carried in stock.

The "Dry-Pressed" Brick are made of excellent clay and are particularly straight and true to shape, laying up with a minimum thickness of joint. They are especially liked for boiler settinfs, etc. Supplied in the 9″ straight brick but, unless in large quantities, shapes cannot be supplied in the "Dry-Pressed" Brisk.

In ordering, be ecareful to specify which kind of brick is desired.

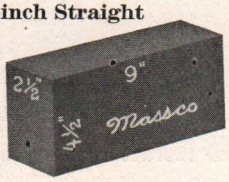
Fire Brick should be laid up with a ground fire clay of equal refractoriness to the brick and the use of our Fire Clay is strongly recommended.

We solicit the opportunity of quoting upon SPECIAL TILE, and are prepared to execute orders for the most complicated designs in a prompt and satisfactory manner, making them of the material best suiteed for the particular requirements of the case.

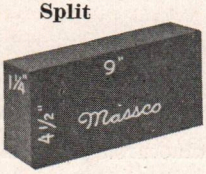
FIRE BRICK

STANDARD 9-INCH AND 9-INCH SHAPES

9-inch Straight **Split** **Soap**



No. 4284A

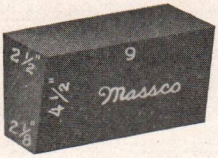


No. 4284B

No. 4284C

Style	Dimensions, Inches
Standard	4½x2½x9
Split	4½x1¼x9
Soap	2½x2¼x9

No. 1 Arch **No. 2 Arch**

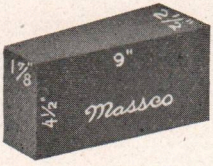


No. 4284D

No. 4284E

Number	Style	Dimensions, Inches	Inside Diam., Inches	Brick to Circle
1	Arch	4½x9 Taper 2½ to 2⅛	51	76
2	Arch	4½x9 Taper 2½ to 1¾	21	38
3	Arch	4½x9 Taper 2½ to 1	6	19

No. 1 Wedge **No. 2 Wedge**



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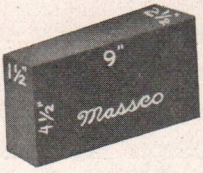
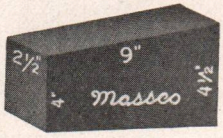


No. 4284G

Number	Style	Dimensions, Inches	Inside Diam., Inches	Brick to Circle
1	Wedge	4½x9 Taper 2½ to 1⅞	54	91
2	Wedge	4½x9 Taper 2½ to 1½	27	57

No. 1 Key **No. 2 Key** **No. 3 Key**



No. 4284H

No. 4284I

No. 4284J

Number	Style	Dimensions, Inches	Inside Diam., Inches	Brick to Circle
1	Key	2½x9 Taper 4½ to 4	144	113
2	Key	2½x9 Taper 4½ to 3½	63	57

FIRE BRICK

3	Key	2½x9 Taper 4½ to 3	36	38
4	Key	2½x9 Taper 4½ to 2¼	18	25

End Skew

No. 4285A

Side Skew

No. 4285B

Jamb Brick

No. 4285C

Skew brick, as per illustrations, carried in stock. Any other angles made to order.

END SKEW	9x6 ⅛x4 ½x2 ½
SIDE SKEW	9x4 ½x1 ¾x2 ½
EDGE SKEW	9x4 ½x1 ½x2 ½
FEATHER EDGE SKEW	9x4 ½x ⅛ 2 ½
JAMB BRICK	9x4 ½x2 ½

Prices on application.

PRICES OF SQUARE AND SHAPE FIRE BRICK AND CLAY

(F. O. B. Denver)

No. 4285D

Fire Brick, 9x4 ½x2 ½ inches, best grade dry pressed, per 1000 ....

Shape Brick, not exceeding 9x4 ½x2 ½ inches, per 1000 ....

Ground Fire Clay, in 100-pound sacks, per ton ....

Prices on application.

CIRCLE BRICK

No. 4285E

Diameter Inside	Diameter Outside	Thickness	Width	Number to crate
24 inch	33 inch	2½ inch	4½ inch	12
36 inch	45 inch	2½ inch	4½ inch	16
48 inch	57 inch	2½ inch	4½ inch	20
60 inch	69 inch	2½ inch	4½ inch	24
72 inch	81 inch	2½ inch	4½ inch	28

FIRE BRICK AND TILE

CUPALO BLOCKS, STANDARD SIZES

	Size	Diameter Inside	Diameter Outside	Number to Circle	Weight each Block
4286A	A	16 inch	25 inch	9	20½
4286B	B	21 inch	30 inch	11	22
4286C	C	27 inch	36 inch	12	23½
4286D	D	30 inch	39 inch	14	22
4286E	E	40 inch	49 inch	17	23½
4286F	F	51 inch	60 inch	21	23½
4286G	G	60 inch	69 inch	24	24
4286H	H	73 inch	84 inch	29	29½

Other sizes made to order. Prices on application.

CYLINDER LINING

4286I We are prepared to furnish linings for revolving roasters, etc., making them of any thickness desired; and with tongue in groove, which makes the lining stay in place better, and allows the lining to be made somewhat thinner.

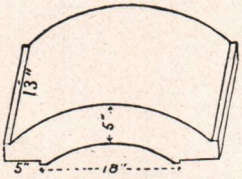
We guarantee the material and workmanship to be of the highest grade. It may be made with or without shelves for stirring up the material. The most common shelf is merely a plain projection of about two or three inches, there being four or five to the circle. We will be glad to quote upon your specifications.

BRASS AND CANDY FURNACE AND CYLINDRICAL STOVE LININGS

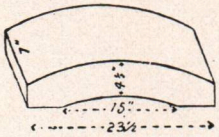
Diam., In. Outside	Diam., In. Inside	Thickness, Inch	Height, One Circle, In.	No. to Circle	No. to Set
18	14	2	6	6	----
21	16	2½	8	6	----
24	19	2½	12	6	----
24	16	4	12	6	18
25	18	3½	12	6	18
28	18	5	12	6	18
9	7	1	4	5	15
10	8	1	4	5	15
11	9	1	4	5	15
12	10	1	4	5	15
13	11	1	4	5	15

With the above standard sizes can be supplied a special flue or throat tile.

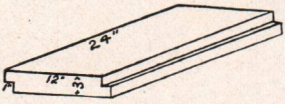
TILE



Arch Tile
No. 4286J
For Arching over
Fire Boxes



Arch Tile
No. 4286K
For Arching over
Fire Boxes



Flanged or Babbeted Tile
No. 4286L
Regular Sizes
12x24x2½ and 12x24x3
Any other sizes made to order

PLAIN STOVE BACK TILE. See Rectangular Tile, on following page.

LIST OF RECTANGULAR TILE IN STOCK

No. 4287A

Thickness Ins.	Width Ins.	Lgth. Ins.	Wgt. Lbs.	Thickness Ins.	Width Ins.	Lgth. Ins.	Wgt. Lbs.	Thickness Ins.	Width Ins.	Lgth. Ins.	Wgt. Lbs.
1	6	16	7	2	14	24	47	3	4½	36	34
1	6	18	8	2	16	16	36	3	8	18	30
1	6	20	9	2	16	18	40	3	8	20	34
1	7	20	10	2	18	18	46	3	8	24	41
1	8	20	11	2	18	24	61	3	10	18	38
1½	6	16	10	2½	4½	18	14	3	10	20	42
1½	6	18	12	2½	4½	24	19	3	10	24	50
1½	6	20	13	2½	4½	28	22	3	12	18	46
1½	6	22	14	2½	6	18	19	3	12	20	50
1½	6	24	15	2½	6	24	25	3	12	24	61
1½	7	18	13	2½	7	18	22	3	12	30	76
1½	7	20	15	2½	7	24	30	3	12	36	91
1½	7	24	18	2½	8	18	25	3	14	20	59
1½	8	18	15	2½	8	20	28	3	14	24	71
1½	8	20	17	2½	8	24	34	3	14	30	88
1½	8	24	20	2½	10	18	32	3	14	36	106
1½	10	16	17	2½	10	24	42	3	16	24	81
1½	10	18	19	2½	12	12	25	3	16	36	121
1½	10	24	25	2½	12	14	30	3	18	18	68
1½	12	24	31	2½	12	18	38	3	18	22	83
2	4½	24	15	2½	12	24	50	3	18	24	91
2	6	22	19	2½	12	30	63	3	18	36	136
2	6	24	20	2½	14	14	34	3	24	24	121
2	7	20	20	2½	14	16	39	4	8	18	41
2	7	24	24	2½	14	18	44	4	8	20	45
2	8	18	20	2½	14	20	49	4	8	24	54
2	8	20	23	2½	14	30	74	4	10	20	56
2	8	24	27	2½	16	16	45	4	10	24	68
2	10	18	25	2½	16	18	50	4	10	30	84
2	10	20	28	2½	16	24	67	4	12	18	61
2	10	24	34	2½	18	18	57	4	12	20	67
2	12	12	20	2½	18	22	69	4	12	24	81
2	12	14	24	2½	18	24	76	4	12	30	101
2	12	16	27	2½	24	24	101	4	12	36	121
2	12	18	30	3	4½	20	19	4	14	24	94
2	12	20	34	3	4½	24	23	4	14	30	118
2	12	24	40	3	4½	30	29	4	14	36	141

Tile of other sizes made to order or for immediate shipment may be cut from a suitable stock size at a moderate additional cost.

FIRE EXTINGUISHERS

No. 4288A

No. 4288B

"DRAGON" FIRE EXTINGUISHERS

This fire extinguisher is the latest model and is approved by the National Board of Underwriters.

It is built of heavy Lake Superior cold-rolled copper, and is, we believe, the strongest fire extinguisher of its type on the market.

It differs from other extinguishers in that the method of attaching the dome end bottom to the body of the shell makes the joints the strongest part of the machine. The main sheet of the extinguisher will rupture under heavy pressure before any of the seams will yield.

The dome and bottom are spun, not stamped; the interior is lined by immersing the extinguisher in molten metal; all soldering is done with blow pipe, insuring even heat (no soldering irons used); so-called wiped joints are employed; the bottle holder is of cast brass, not wire; a rawhide gasket is used at the top and a ground joint at the hose elbow; the stopper is of heavy lead and unbreakable.

4288A Price .....each $15.00

"QUICKOUT" FIRE EXTINGUISHERS

The "Quickout" fire tube contains a perfectly harmless powder. Put up in red color lithographed tin tubes, 22 inches long, $2\frac{1}{16}$ inches in diameter.

All you have to do is to catch hold of the fire tube and give it a jerk from the hook. This pulls off the cap and you flirt the powder over the fire, which will be extinguished immediately. The heat liberates carbonic acid gas in large quantities and that smothers the fire.

The tube may hang unsued for five years, and the powder will be just as good then as the day you put the tube in place.

4288B Price .....each $1.50

FIRE EXTINGUISHERS

No. 4289A

PYRENE EXTINGUISHER

No. 4289A

4279A Type 1961. The pump is strongly built of brass and white metal. With ordinary care it is indestructible. It cannot rust or corrode. It is 14 inches long and three inches in diameter. When filled it weighs six pounds. It is so simple a ten-year-old child can operate it effectively. There are no valves or cranks to get out of order. It is always ready.

Pyrene is the Universal Fire Extinguisher. It consists of a double acting pump, operated by hand. Its capacity is one quart. Each drive of the pump handle throws an ounce of liquid 25 feet.

Pyrene is the Standard Fire Extinguisher for use in Homes, Automobiles, Garages, Factories, Schools, Hospitals, Motorboats, etc.

Pyrene is inspected, approved and labeled by the Underwriters' Laboratories, Inc.

Approved by the United States Steamboat Inspection Service.

Recognized by the New York and Chicago Fire Insurance Exchanges and all Rating Bureaus.

Approved by Good Housekeeping Institute.

Pyrene was awarded highest gold medal at the Panama-Pacific Exposition in San Francisco, 1515.

No. 4289B

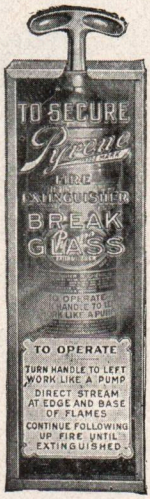
PYRENE LIQUID

4289B Type 1983. Pyrene liquid is a chemical mixture. It contains no water. When it comes in contact with fire, Pyrene forms a heavy, non-poisonous gas that smothers the flame. Pyrene liquid will put out all kinds of fire. It is as effective on an electric arc of 100,000 volts as on burning shavings. It will instantly extinguish blazing gasoline, grease, or oil that water makes worse by scattering. Carried on your auto it will save you 15% each year on your insurance premium.

Pyrene is a non-conductor. Hence it is absolutely safe to use on electrical fire. As it does not deteriorate with age, there is no expense for upkeep.

Pyrene will not injure the filmiest fabrics. The most delicate colors are not spotted by it. It will not stain or discolor ceilings or wall paper. It will not hurt the mechanism of a fine watch.

Pyrene will not freeze at 50 degrees below zero, making it particularly adaptable for use in barns, stables, mills, storehouses, refrigerator plants and other places lacking heat.



No. 4289B

No. 4289C

PRICE LIST OF PYRENE PRODUCTS

Brass Extinguisher	$7.00	Brackets, galvanized or enameled, black, blue and red	$0.50
Nickel Extinguisher	8.00	Brackets, brass finish	.75
Liquid, per quart	1.00	Brackets, nickel finish	1.00
Liquid, per gallon	4.00		

	Metal	Wood
Boxes for (1) Extinguisher	$1.00	$1.50
Boxes for (2) Extinguishers	1.50	2.00
Boxes for (3) Extinguishers	2.00	2.50

FIRE EXTINGUISHERS

JOHNS-MANVILLE FIRE EXTINGUISHER

No. 4290A
Five to standard carton. Shipping weight (approximately), 42 lbs.

4290A The Johns-Manville Fire Extinguisher possesses every resirable feature of a one-quart type-plus and exclusive two-way method of operation. This method permits discharge either by pumping or by storing sufficient pressure with nozzle closed to discharge contents when nozzle is opened. With the latter method both hand are left free to aim and operation in cramped quarters is greatly facilitated.

The time to fight fire is when it starts —and the Johns-Manville Fire Extinguisher is instant and certain of action. It will put out any kind of incipient fire from blazing oil, grease chemicals or electric arc. Examined, approved and labeled by the Underwriters' Laboratories, Inc., under the direction of the National Board of Fire Underwriters.

Price, complete, nickel or brass finish, including black enameled bracket for wall, automobile or truck use.

East of Rockies.....each $10.00
West of Rockies .....each 10.50

Packed in individual boxes. Shipping weight (approximately), 8 lbs.

JOHNS-MANVILLE FIRE EXTINGUISHER FLUID

4290B Johns-Manville Extinguishing Fluid for recharging is sold in sealed cans or drums. This fluid never deteriorates, is non-corrosive, a non-conductor, and the only fluid recommended for use in the Johns-Manville Extinguisher.

PRICES

One quart can, per quart, shipping weight (approximately) 3½ lbs.....$1.50
Five to standard carton, shipping weight (approximately) 23 lbs.

One gallon can 6.00

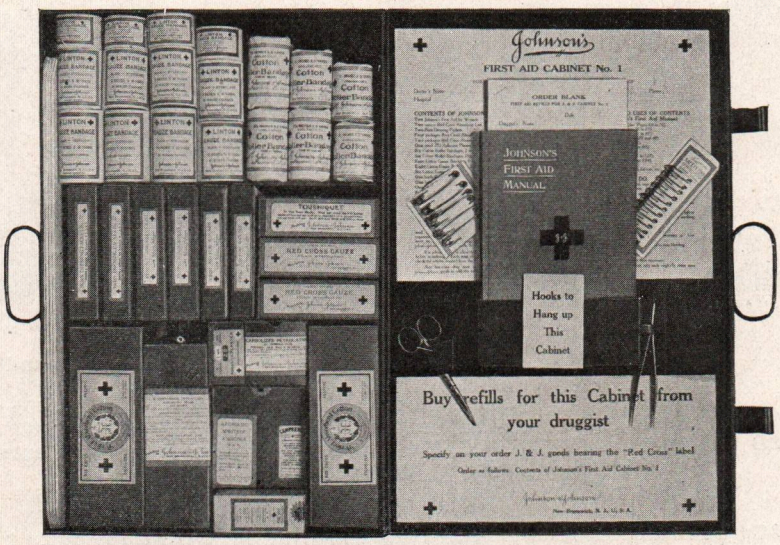
JOHNS-MANVILLE SUCCESS FIRE EXTINGUISHER

4290C A standard 2½ gallon soda and acid upset type machine bearing the approval of the Underwriters'. It is easy to operate and instantaneous in action. Throws a 50-foot stream of water that is 40 times more effective than water.

Made of extra heavy Lake Superior cold-rolled copper, securely reveted and reinforced by heavy shoulder of solder. Tested to stand pressure of 350 pounds to the square inch. Bottle holder is of cast brass.

Price $15.00

FIRST AID CABINETS



No. 4291A

4291A **FIRST AID CABINETS,** very compact, put up in heavy black japanned tin carrying case with handles. They contain everything necessary for the treatment of wounds, cuts, bruises, etc. A most practical outfit, and should be found in all mine, mill, and assay offices.

A manual giving full directions for treatment for all accidents is supplied with the cabinet.

LIST OF CONTENTS

Two Johnson's First Aid for Wounds.
Two ounces Red Cross Absorbent Lint.
One Capsule Iodoform Gauze.
Six one-yard packages Red Cross Absorbent Gauze.
Three 4-ounce packages Red Cross Cotton.
One Spool "Z O" Adhesive Plaster, 1 inch wide.
Nine Roller Cotton Bandages, 2 inches wide.
Nine Roller Cotton Bandages 2½ inches wide.
Nine Linton Gauze Bandages, 2 inches wide.
Nine Linton Gauze Bandages, 2½ inches wide.
One Jar Carbonized Petrolatum.
One Bottle Camphenol and bottle for solution.
One Scissors. One Tweezers.
One Tourniquet. Two Packages Safety Pins.
One Johnson's First Aid Manual.

Price complete $9.50

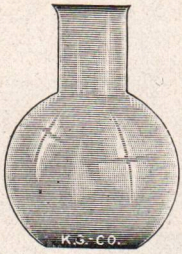
4291B **FIRST AID CABINET—MINERS' SPECIAL.** In metal cabinet containing the following:

12 Triangular Bandages.
42 Bandage Compresses, asst'd sizes.
6 yds. Picric Acid Gauze.
1 Bottle Aromatic Spirits Ammonia.
6 Paper Cups.
6 Splints.
1 Tourniquet.
1 Spoon.
12 Safety Pins.
1 Scissors.
1 Tweezers.
1 First Aid Handbook.

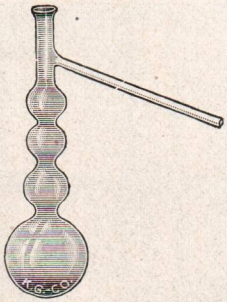
Price $9.00

FLASKS

No. 4292A



No. 4292B



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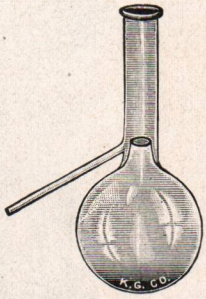


No. 4292D

4292A **FLASKS, ASSAY.** Conical, high form, with narrow mouth and spout. Type 7495.

Capacity, cc	60	120	250	500	1000
Each	$0.12	.15	.20	.25	.50

4292B **FLASKS, CARBONIC ACID.** Light weight, low form, with extra wide mouth and flat bottom. Type 7500.

Capacity, cc	30	60	120	150	250
Each	$0.10	.12	.15	.20	.25

4292C **FLASKS, DISTILLATION, LADENBURY'S.** With three bulbs in neck. Type 7565.

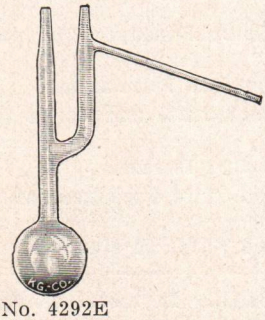
Capacity, cc	125	250	500	1000
Each	$0.50	.85	1.10	1.45

4292D **FLASKS, DISTILLATION, LUNG'S.** With trap and neck. Type 7570.

Capacity, cc	125	250	500
Each	$0.90	1.05	1.35

4292E **FLASKS, DISTILLATION, CLAISEN'S.** Type 7575.

Capacity, cc	60	125	250	500
Each	$0.70	.85	1.00	1.30



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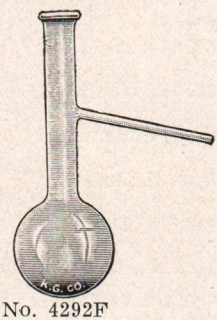

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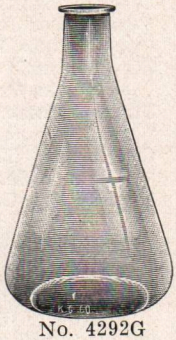

No. 4292G

4292F **FLASKS, DISTILLATION, ENGLER'S.** Standard dimensions for oil distilation. Type 7580.

Capacity, cc	100	250
Each	$0.46	.60

4292G **FLASKS, ERLENMEYER.** Regular width mouth. Type 7585.

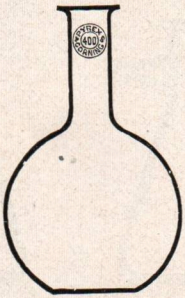
Capacity, cc	30	60	120	180	250	360	500	750	1000	2000
Each	$0.17	.18	.22	.23	.26	.31	.34	.42	.49	.81

PAT. PYREX CORNING 5-27-19

PYREX FLASKS

PAT. PYREX CORNING 5-27-19

Each article of Pyrex chemical ware is stamped with the trade-mark shown with its capacity marked within inner circle.



Boiling Flask
Flat Bottom—Vial Mouth

4293B BOILING FLASKS. Flat Botton—Ring Neck—Type 4.

Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
500	72	5	$ .38
700	36	6	.47
1000	36	7	.55
1500	24	7	.66
2000	18	8	.78
3000	12	9	.99
6000	12	10	1.75
12000	6	10	3.30
12000	6	13	3.30

4293C BOILING FLASKS. Round Bottom—Vial Mouth—Type 5.

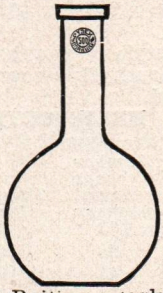
Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
100	84	2	$ .18
150	180	3	.20
200	144	3	.22
300	84	4	.28
400	72	4	.32
500	48	4	.37
700	42	6	.45
1000	30	6	.56
1500	24	7	.71
2000	18	9	.79
3000	12	10	1.07

Unless otherwise stated, the flat bottom vial mouth boiling flasks will be supplied.

4293A BOILING FLASKS. Flat Bottom—Vial Mouth—Type 3.

Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
50	192	0	$ .17
100	168	1	.18
150	108	1	.20
200	144	3	.22
300	96	4	.25
400	84	4	.27
500	72	6	.30
700	36	6	.36
1000	36	7	.43
1500	24	7	.51
2000	18	8	.60
3000	12	9	.76
6000	12	10	1.60
12000	6	10	3.00
12000	6	13	3.00

Boiling Flask
Round Bottom—Viol Mouth



Boiling Flask
Flat Bottom—Ring Neck

It is advisable when ordering to fully describe articles as in above headings.

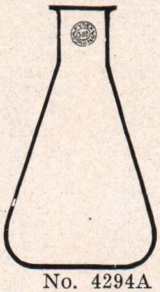
A discount of 10 per cent. allowed on chemical ware ordered in original packages.

PAT. PYREX CORNING 5-27-19

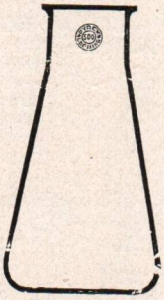
PYREX FLASKS

Each article of Pyrex chemical ware is stamped with the trade-mark shown with its capacity marked within inner circle.

PAT. PYREX CORNING 5-27-19

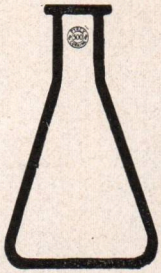


No. 4294A Erlenmeyer Flask —Narrow Mouth



No. 4294B Erlenmeyer Flask —Wide Mouth

No. 4294C Filtering Flask —Heavy Wall with Tubulature



No. 4294D Filtering Flask —Heavy Wall without Tubulature

4294A ERLENMEYER FLASKS.
Narrow Mouth—Type 6.

Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
25	360	00	$ .16
50	276	1	.16
100	180	3	.18
150	252	4	.18
200	144	5	.20
250	132	5	.22
300	132	6	.25
500	72	6	.29
600	60	6	.31
750	48	7	.34
1000	36	8	.42
1500	24	9	.51
2000	24	10	.60
3000	15	10	.79
4000	12	10	1.00
6000	6	10	1.60

Unless style of mouth is stated, the narrow mouth Erlenmeyed flask will be supplied.

4294B ERLENMEYER FLASKS.
Wide Mouth—Type 7.

Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
250	132	7	$ .22
500	60	10	.29
750	48	10	.34
1000	36	11	.42
2000	24	13	.60

4294C FILTERING FLASKS.
Heavy Wall with Tubulature—Type 8.

Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
250		6	$ .70
500		6	.95
1000		7	1.45
2000		9	2.40
4000		9	4.00

4294D FILTERING FLASKS.
Heavy Wall without Tubulature—Type 9.

Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
250		6	$ .40
500		6	.54
1000		7	.84
2000		9	1.20
4000		9	2.00

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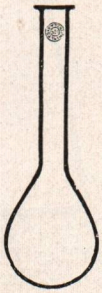
PAT. PYREX CORNING 5-27-19

PYREX FLASKS

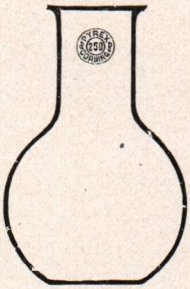
PAT. PYREX CORNING 5-27-19

Each article of Pyrex chemical ware is stamped with the trade-mark shown with its capacity marked within inner circle.

No. 4295A
Kjeldahl Flask
Flat Bottom
Long Neck



No. 4295B
Kjeldahl Flask
Round Bottom
Long Neck



No. 4295D
Extraction Flask
Flat Bottom
Wide Neck
Vial Mouth

No. 4294E
Extraction Flask
Round Bottom
Wide Neck
Vial Mouth

4295A **KJELDAHL FLASKS.** Flat Bottom. Long Neck.

Capacity C. C.	Number pieces in original package	Length over all approximate	Stopper No.	List price, each, in broken package
300	60	10½″	5	$ .28
500	36	12⅛″	6	.37

4295B **KJELDAHL FLASKS.** Round Botton. Long Nec.

Capacity C. C.	Number pieces in original package	Length over all approximate	Stopper No.	List price, each, in broken package
300	60	11¾″	5	$ .28
500	36	12¾″	6	.37
650	36	12¾″	6	.42
800	36	14⅜″	6	.45

4295C **KJELDAHL FLASKS.** Round Bottom. Short Neck.

Capacity C. C.	Number pieces in original package	Length over all approximate	Stopper No.	List price, each, in broken package
300	60	9⅛″	5	$ .28
500	36	9¾″	6	.37
800	36	11	6	.45

Unless otherwise stated the long neck, round bottom, Kjeldahl flasks will be supplied.

4295D **EXTRACTION FLASKS.** Flat Bottom. Wide Neck. Vial Mouth.

Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
50	168	6	$ .16
100	120	6	.18
150	108	7	.19
250	120	8	.20
500	60	10	.29
750	48	10	.36
1000	36	11	.54

4295E **EXTRACTION FLASKS.** Round Bottom. Wide Neck. Vial Mouth.

Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
100	120	6	$ .18
2000	18	13	.69

Unless otherwise stated the flat bottom Extraction flask will be supplied.

It is advisable when ordering to fully describe articles as in above headings.

A discount of 10 per cent. allowed on chemical ware ordered in original packages.

PAT. PYREX CORNING 5-27-19

PYREX FLASKS

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PAT. PYREX CORNING 5-27-19

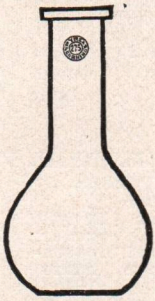
4296A RUBBER EXTRACTION FLASK. Type 22.

Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
500	72	9	$ .32

No. 4296A
Rubber Extraction Flask

4296B JOHNSON SULPHUR FLASK. Heavy Ring Neck. Type 23.

Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
275	108	6	$ .32



No. 4296B
Johnson Sulphur Flask
Heavy Ring Neck

4296C CULTURE FLASK—KOLLE. With neck indentation. Type 24.

Capacity C. C.	Number pieces in original package	List price, each in broken package
320	84	$ .75

No. 4296C
Culture Flask-Kolle with neck indentation

It is advisable when ordering to fully describe adticles as in above headings.

A discount of 10 per cent. allowed on chemical ware ordered in original packages.

PAT. PYREX CORNING 5-27-19

PYREX FLASKS TUBULATED

PAT. PYREX CORNING 5-27-19

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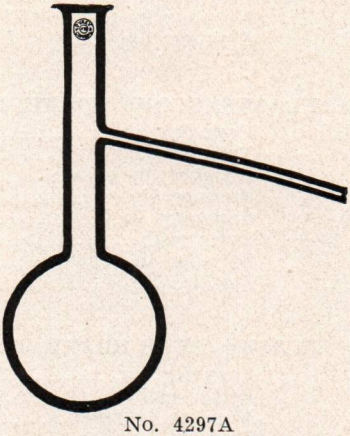
4297A **DISTILLING FLASK.** With Tubulature. Type 18.

Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
25	108	1	$ .36
50	108	1	.40
100	56	2	.45
125	84	3	.50
200	72	3	.55
250	36	3	.60
300	40	4	.65
500	32	4	.70
1000	24	6	1.18
1500	18	7	1.45
2000	10	9	1.60
3000	6	10	2.15



No. 4297A
Distilling or Engler Flask with tubulator

4297B **DISTILLING FLASK—ENGLER.** With tubulature. Type 19.

Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
100	56	1	$ .50
200	72	2	.60
250	60	2	.68

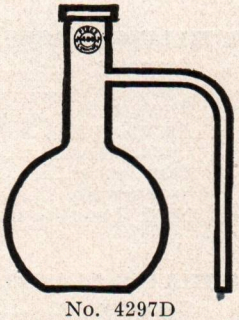
4297C **MOISTURE TEST FLASK.** With Tubulature. Type 20.

Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
1000	48	5	$1.25

Packed two in a carton

4297D **SULPHUR DETERMINATION FLASK.** With tubulature. Type 25.

Capacity C. C.	Number pieces in original package	Stopper No.	List price, each, in broken package
500	40	5	$ .75



No. 4297D
Sulphur Determination Flask with tubulature

It is advisable when ordering to fully describe articles as in above headings.

A discount of 10 per cent. allowed on chemical ware ordered in original packages.

Prices for distilling Flasks others than shown above on application.

FLASKS

FRY—QUALITY

4298A **ERLENMEYER FLASKS.** Type 6000.

Capacity, cc.	30	60	90	120	150	180	250
Price each	$0.11	.12	.13	.13	.14	.14	.15
Number in case	360	276	180	180	252	144	132
Stopper No.	2	2	3	3	4	4	5
Capacity, cc.	300	350	500	700	1000	1400	2000
Price each	$0.17	.19	.21	.29	.34	.42	.50
Number in case	132	132	72	48	36	24	24
Stopper No.	5	5	6	7	7	9	9

4298B **FLASKS, GLOBE SHAPE,** Round or Flat Bottom. Type 6200.

Capacity, cc.	30	60	120	200	250
Price each	$0.11	.12	.13	.14	.15
Number in case	192	192	108	144	96
Stopper No.	0	1	2	3	3
Capacity, cc.	400	500	700	1000	2000	3000
Price each	$0.19	.21	.29	.34	.50	.75
Number in case	84	72	36	36	18	12
Stopper No.	4	5	6	7	9	10

4298C **FLASKS, PEAR SHAPE,** Flat or Round Bottom. Type 6210.

Capacity, cc.	30	60	90	120	180	250
Price each	$0.11	.12	.13	.13	.14	.15
Number in case	192	192	168	108	144	96
Stopper No.	0	2	2	3	3	4
Capacity, cc.	350	500	700	1000	1400	2000
Price each	.19	.21	.29	.34	.42	.50
Number in case	84	72	36	36	24	18
Stopper No.	5	5	6	6	8	9

4298D **DISTILLING FLASKS.** Bodies only. Type 6220.

Capacity, cc.	30	60	90	150	180	250
Price each	$0.21	.23	.27	.29	.30	.32
Stopper No.	00	0	2	3	4	5
Neck Length, mm.	67	88	155	170	185	200
Capacity, cc.	350	500	700	1000	2000
Price each	$0.34	.42	.50	.56	1.00
Stopper No.	5	5	6	7	9
Neck Length, mm.	200	200	210	210	250

4298E **DISTILLING FLASKS.** Bodies only. Type 6225.

Capacity, cc.	125	150	180	250
Price each	$0.20	.21	.22	.24
Stopper No.	3	3	3	3
Neck Length, mm.	90	95	110	115
Capacity, cc.	*250	350	500	700	1000
Price each	$0.24	.26	.30	.39	.45
Stopper Length, mm.	2	4	5	6	7
Neck Length, mm.	150	130	150	160	175

*Standard Engler Distilling Bulb, No. 6221.

FLASKS

4299A LARGE-NECK ERLENMEYER FLASKS. Type 6007.

Capacity, cc.	250	350	600
Price each	$0.15	.19	.25
No. in case	132	132	48

4299B EXTRACTION FLASKS FOR RUBBER ANALYSIS. Type 6302.

Capacity, cc.	200	300
Price each	$0.18	.21
Number in case	96	96

4299C COPPER FLASKS.

Type 6211.

Capacity, cc.	180
Priec each	$ .14
Number in case	144

4299D COPPER FLASKS.

Type 6212.

Capacity, cc.	150	250
Price each	$ .14	.15
Number in case	144	96

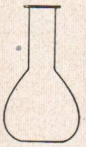
4299E BALLOON FLASKS, VIAL MOUTH. Type 6215.

Capacity, c. c.	90	120	250	500	1000	2000	3000	12000
Price each	$ .13	.13	.15	.21	.34	.50	.75	3.00
Number in case	108	108	96	72	36	18	12	6
Stopper No.	4	5	6	7	8	9	9	11

4299F KJELDAHL FLASKS. Type 6240.

Capacity, c. c.	300	500	800
Price each	$ .30	.40	.50
Neck Length, mm.	150	170	200
Number in case	60	36	36
Stopper No.	6	6	7

4299G SULPHLUR FLASKS. Johnson's. Type 6270.



Capacity, cc.	125	270
Price each	$ .14	.22
Stopper No.	6	7
No. in case	144	96

4299H PHOSPHORUS FLASK. Type 6002.

Capacity, cc.	400
Price each	$ .20
Stopper No.	4
Number in case	96

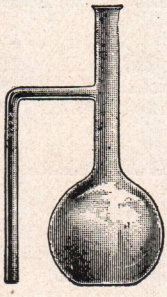
4299I EXTRATION FLASKS. Type 6300.

Capacity, c. c.	60	125	175	250
Price each	$ .11	.13	.17	.21
Number in case	192	120	144	96
Stopper No.	7	7	8	9

4299J ASSAY FLASKS OR PHILLIPS BEAKERS. Type 6310.

Capacity, c. c.	125	250	500	1000
Price each	$ .13	.17	.25	.42
Number in case	180	132	72	36

FLASKS



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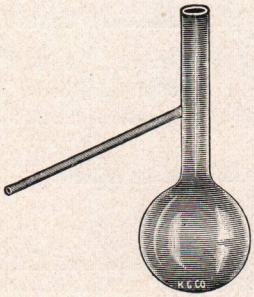


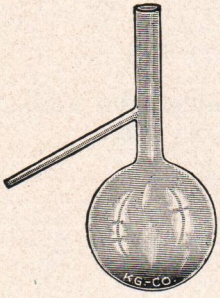
No. 4300B

4300A **FLASKS, DISTILLATION.** So-called Sulphur Flasks, with side tube bent down at right angle. Type 7540.

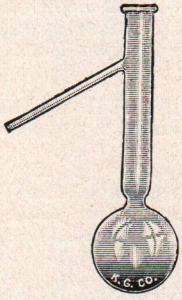
Capacity, cc.	250	500	1000
Each	$0.92	1.20	1.70

4300B **FLASKS, DISTILLATION.** With side tube in middle of neck. Type 7545.

Capacity, cc.	30	60	125	250	500	1000	2000
Each	$0.30	.40	.50	.75	.92	1.35	2.00



No. 4300C



No. 4300D

4300C **FLASKS, DISTILLATION.** With side tube low on neck. Type 7550.

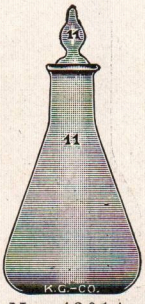
Capacity, cc.	30	60	125	250	500	1000	2000
Each	$0.30	.40	.50	.75	.92	1.35	2.00

4300D **FLASKS, DISTILLATION.** With side tube high on neck. Type 7555.

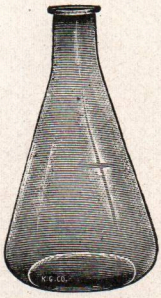
Capacity, cc.	30	60	125	250	500	1000	2000
Each	$0.30	.40	.50	.75	.92	1.35	2.00

4300E **FLASKS, DISTILLATION, HEMPEL'S.** As used in U. S. Department of Agriculture Forest Service for the distillation of creosote; capacity, 500 cc. Type 7560. Each $1.20

FLASKS



No. 4301A


No. 4301B

No. 4301D

4301A **FLASKS, ERLENMEYER.** With ground in glass stopper. Type 7595.

Capacity, cc.	125	250	500	1000
Each	$0.60	.80	1.00	1.50

4301B **FLASKS, FILTERING.** Erlenmeyer shape, heavy glass to withstand pressure. Type 7600.

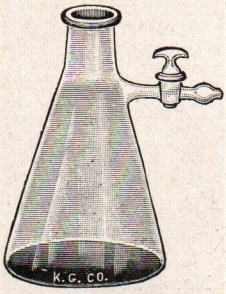
Capacity, cc.	250	500	1000	2000
Each	$0.23	.32	.45	.75

4301C **FLASKS, FILTERING.** Extra heavy, same as No. 7600, with side neck. Type 7605.

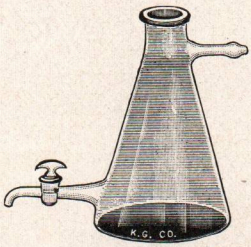
Capacity, cc.	250	500	1000	2000
Each	$0.47	.67	1.00	1.95

4301D **FLASKS, GENERATING,** S. C. Gas bottles.

Capacity	oz. 8	16	24	32
Each	$0.20	.25	.30	.35



No. 4301E



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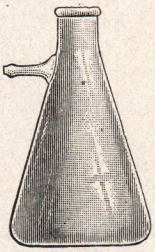

No. 4301G

4301E **FLASKS, FILTERING.** With side neck and glass stopcock. Type 7610.

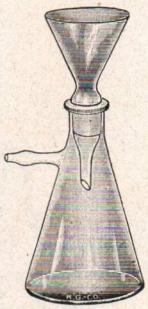
Capacity, cc.	250	500	1000	2000
Each	$1.90	2.25	3.75	5.25

4301F **FLASKS, FILTERING.** Erlenmeyer shape. Heavy glass with side tube in neck and in addition tubulation with stopcock on opposite side near bottom. Capacity, 1000 cc. Type 7615.
Each $3.00

4301G **FLASKS, FILTERING.** Conical, with side neck, for use with filter pump.

Capacity	oz. 8	16	32
Each	$0.35	.45	.60

FLASKS


No. 4302A

No. 4302B

No. 4302C

4302A **FLASKS, FILTERING.** Erlenmeyer shape. Heavy, with side tube and with funnel ground into neck. Type 7620.

Capacity, cc.	2.00	1000
Each	$2.70	4.10

4302B **FLASKS, KJELDAHL.** Flat bottom, short neck. Type 7625.

Capacity, cc.	100	200	300	500	800	1000	1500	2000
Each	$0.22	.26	.34	.46	.52	.68	.84	.96

4302C **FLASKS, KJELDAHL'S.** Same as No. 7625, pear shape, short neck, round bottom. Type 7630.

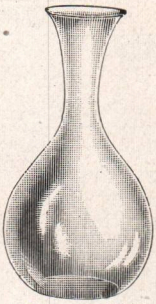
Capacity, cc.	200	500	800	1000
Each	$0.26	.46	.52	.68

4302D **FLASKS, KJELDAHL.** Pear shape, long neck, round bottom. Type 7635.

Capacity, cc.	200	500	800	1000
Each	$0.30	.50	.60	.76

No. 4302D

No. 4302F


No. 4302G

4302E **FLASKS, JOHNSON.** For sulphur determination, for use in iron and steel analysis, with heavy ring neck, taking a No. 6 Rubber Stopper. Capacity, 275 cc. to base of neck; height, 165 m/m. Type 7640. Each ..... $ .40

4302F **FLASKS, SOIL ANALYSIS.** With long condenser tube ground in with air-tight joint. Type 7645.

Capacity, cc.	200	250	500
Each	$2.40	2.70	3.00

4302G **FLASKS, COPPER DETERMINATION.** Pear shaped, wide mouth.

Capacity ..... oz.	2	4	6	8	16
Price ..... each	$0.12	.14	.16	.17	.25
Price ..... per dozen	$1.20	1.40	1.60	1.70	2.50

4302H **FLASKS, PYREX.**

FLASKS

No. 4303A

No. 4303B

No. 4303C

4303A **FLASKS, SUGAR.** With two graduations, but without stopper. Type 7650.

Capacity, cc.	50-55	100-110	200-220
Each	$0.42	.52	.76

4303B **FLASKS, SUGAR, KOHLRAUSCH.** With enlarged neck. Type 7655.

Capacity, cc	100	200	200.6	201.2	201.4	400	500
Each	$0.60	1.00	1.00	1.00	1.00	1.50	1.75

4303C **FLASKS, SUGAR, BATES.** Capacity, 100 cc. Pear shaped, with flaring top. Type 7660. Each ..... $ .90

No. 4303D

No. 4303E

No. 4303F

4303D **FLASKS, VOLUMETRIC.** Not stoppered, accurately graduated to contain. Type 7665.

Capacity, cc.	10	25	50	100	200	250	300	500	1000	2000
Each	$0.25	.35	.42	.55	.58	.65	.70	.92	1.20	2.00

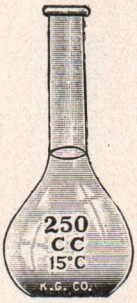
4303E **FLASKS, VOLUMETRIC.** Ground glass stopper, accurately graduated to contain. Type 7670.

Capacity, cc.	10	25	50	100	200	250	300	500	1000	2000
Each	$0.40	.55	.65	.95	1.00	1.05	1.15	1.25	1.45	2.35

4303F **FLASKS, VOLUMETRIC.** Ground glass stopper graduated to contain and deliver, with two marks on neck. Type 7675.

Capacity, cc.	100	250	500	1000	2000
Each	$1.45	1.50	2.00	2.25	3.00

FLASKS



No. 4304A

No. 4304B

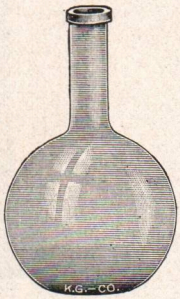
No. 4304C

4304A **FLASKS, VOLUMETRIC.** For fertilizer work. 250 cc. capacity, with short neck, of heavier glass than regular Volumetric Flosks, and with mark low on neck. Type 7680. Each..... $0.76

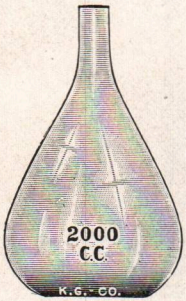
4304B **FLASKS, VOLUMETRIC, GILES.** With glass stopper and two graduations. When used for making Normal Solution, the 10% extra volume in the neck of the flask is used for ascertaining exact tritration, leaving a volume equal to the exact capacity of flask for correction. Type 7685.

Capacity, cc.	500/50	1000/100	2000/200
Each	$2.60	3.60	5.25

4304C **FLASKS, VOLUMETRIC.** For insoluble phosphoric acid determination with wide neck; 25 m/m. inside diameter. Capacity of flask, 200 cc. Type 7690. Each..... $0.60



No. 4304D



No. 4304E

4304D **FLASKS, WASH BOTTLE.** With stout ring neck to withstand corkage. The heavy wall of these flasks makes them much more durable under mechanical stress than the ordinary boiling flasks. Type 7695.

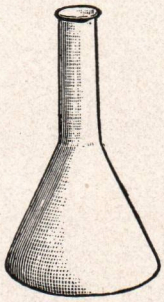
Capacity, cc.	250	500	1000	2000
Each	$0.22	.32	.43	.68

4304E **FLASKS, WATERING.** As used in the determination of water requirements of plants. This flask is of special shaps and of exactly 2000 cc. capacity, there being no other mark on the flask; this feature enables them to be quickly filled by total immersion and insures delivery of the exact amount of water when placed in a vertical position over the pot. (As illustrated in bulletin 284 of the U. S. Department of Agriculture Bureau of Plant Industry.) Type 7700. Each..... $2.25

FLASKS

No. 4305A

No. 4305B



No. 4305C

4305A **FLASKS, PARTING OR ASSAY.** Conical form, with ring, flat ground top.

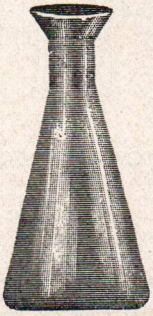
Capacity ..... oz.	1	2	4	6	8
Each	$0.12	.15	.18	.20	.25
Doz.	$1.20	1.50	1.80	2.00	2.50

4305B **FLASKS, PARTING.** Colorado form.

Capacity ..... oz.	½	1	2
Each	$0.10	.12	.15
Doz.	$1.00	1.20	1.50

4305C **FLASKS, MONTANA STYLE.** Capacity, 1 oz. ..... doz. $1.20

No. 4305D



No. 4305E

No. 4305F

4305D **FLASKS, LOW'S.** For copper determination, with funnel top.

Capacity, 4 ounces, each ..... $ .15
Capacity, 6 ounces, each ..... .20

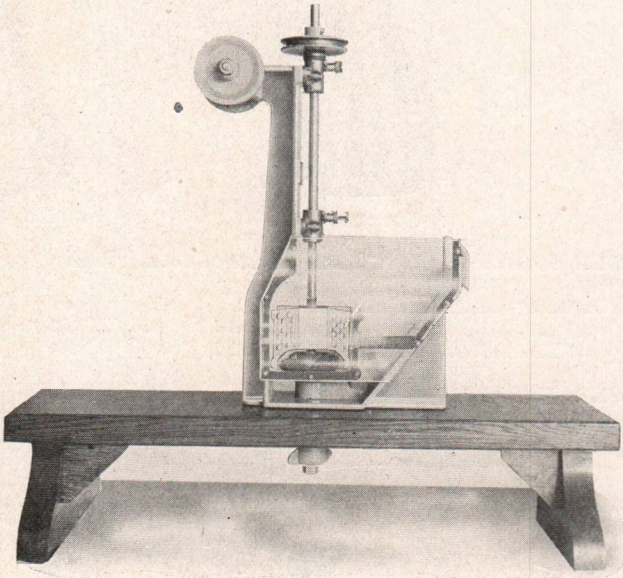
4305E **FLASKS, LOW'S FORM.** For treating insoluble residues, with funnel top.

Capacity, 4 ounces, each ..... .15

4305F **FLASKS, PRESSURE.** For digestions, of heavy glass, well annealed, with patent stopper.

Capacity	100	150	200
Each	$0.40	.50	.60

FLOTATION MACHINES



No. 4306A

4306A THE RUTH LABORATORY TESTING FLOTATION MACHINE.

JUNIOR

A glass front machine for a charge one kilo of ore.

Composed of a single cell having an anti-swirl plate, mounted above the SpumeR as shown in illustration above.

Equipped as illustrated. Furnished either with or without the motor.

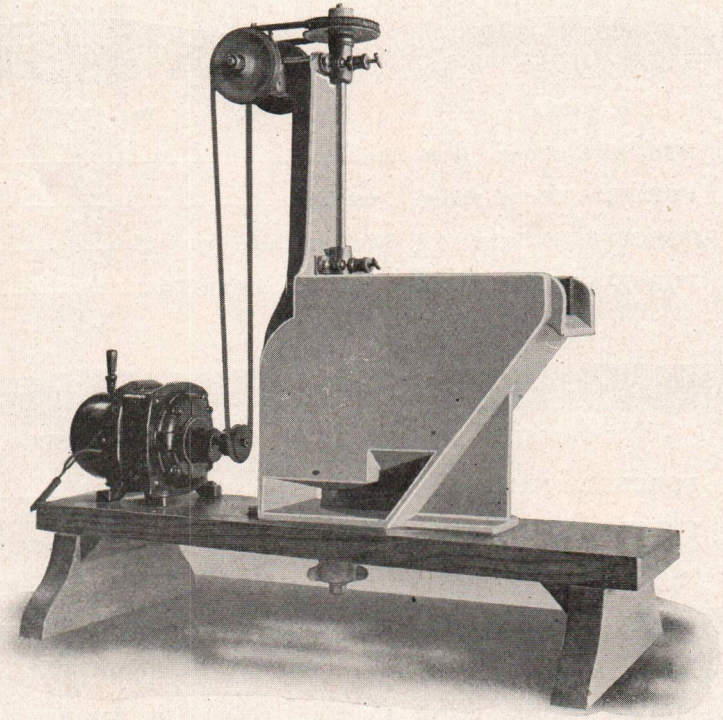
Shipping weight with stand 115 pounds.

Price f. o. b. Denver.....$150.00

Write for Special Bulletin No. 57.

Motor for above, f. o. b. factory.....$ 60.00

FLOTATION MACHINES



No. 4307A

4307A **THE RUTH LABORATORY TESTING FLOTATION MACHINE.**

TYPE X, 6-INCH

Handles a charge of about ten pounds of ore.

Composed of single cell having an anti-swirl plate mounted above the SpumeR as shown in illustration on page 2.

Equipped as illustrated. Furnished either with or without the motor.

Shipping weight with stand 165 pounds.

Price f. o. b. Denver $150.00

Write for Special Bulletin No. 57.

Motor for above, f. o. b. factory ..... $ 60.00

FORCEPS

No. 4308A

No. 4308D

4308A **FORCEPS.** Brass, Bent Ends ..... $ .50

4308B **FORCEPS.** Nickel-plated, Bent Ends ..... .50

4308C **FORCEPS.** Nickel-plated, Straight Ends, Ivory Tips 1.00

4308D **FORCEPS.** Nickel-plated- Bent Ends, Ivory Tips 1.00

No. 4308E

No. 4308F

4308E **FORCEPS.** Nickel-plated, Fine Points, Non-Magnetic $0.50

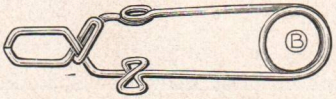
4308F **FORCEPS.** Nickel-plated, Extra Stout, Straight ..... .50

No. 4308G

No. 4308I

4308G **FORCEPS.** Nickel-plated, Especially adapted for fine weights $0.75

4308H **FORCEPS, PLATTNER'S.** Nickel-plated, Forceps on Both Ends, with Palau Tips 4.00



No. 4308J

No. 4308K

4308J **FORCEPS.** For cover glass, nickel-plated. Type 1707 ..... $0.15

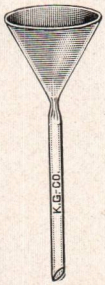
4308K **FORCEPS.** Steel, Plain, for holding Lead Button while slagging.

Size ..... inches	4	5	6	7	8
Price ..... each	$0.15	.20	.25	.35	.50

FOUNDRY RIDDLES... See Sieves.

FUNNELS

No. 4309A



No. 4309B

No. 4309C

No. 4309E

No. 4309D

4309A **FUNNELS, BUNSEN'S.** With extra long, thin stem. Type 7710.

Diameter, m/m.	25	40	50	65	70	75	90	100	125	150
Each	$0.24	.24	.28	.30	.34	.34	.36	.40	.54	.68

4309B **FUNNELS, BUNSEN'S.** With constriction in top of stem, exact angle of 60 degrees, stands approximately 4 inches high, ground to a point. Type 7715.

Diameter, m/m	50	65	75	100
Each	$0.28	.30	.34	.40

4309C **FUNNELS.** With bulb for filtering through glass wool. Type 7720.

Diameter, m/m	100	150
Each	$0.45	.65

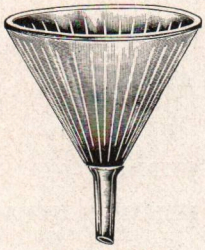
4309D **FUNNELS.** Without stems for sugar analysis. Type 7725.

Diameter, m/m	70	90	100
Each	$0.24	.30	.40

4309E FUNNELS, CARBON FILTER. With stems ground to a point, for use with Gooch's Crucibles. Type 7730.

Diameter at top, m/m	20	25	28	32	35	38
Each	$0.20	.24	.40	.56	.64	.72

No. 4309F


No. 4309G

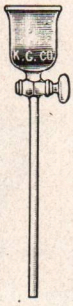
4309F **FUNNELS.** Plain. Of heavy pressed glass. Type 7735.

Diameter, inches	2½	2¾	3¾	4¾	5¾	7¼	8¾	10¼	13
Each	$0.14	.15	.16	.23	.34	.48	.75	1.20	2.60

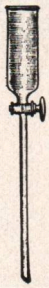
4309G **FUNNELS.** Ribbed. For quick filtering, of heavy pressed glass. Type 7740.

Diameter, inches	2½	2¾	3¾	4¾	5¾	7¼	8¾	10¼	13
Each	$0.14	.15	.16	.23	.34	.48	.75	1.20	2.60

FUNNELS



4310A



4310B

4310C

4310A **FUNNELS, SEPARATORY.** Bell shape with open top. Type 7745.

Capacity, cc.	25	50	75	100
Each	$1.20	1.50	1.65	1.90

4310B **FUNNELS, SEPARATORY.** Cylindrical with open top. Type 7750.

Capcaity, cc.	30	60	100	125	150	200	250
Each	$1.25	1.45	1.75	1 90	2.00	2.10	2.20

4310C **FUNNELS, SEPARATORY.** Cylindrical with ground glass stopper. Type 7755.

Capacity, cc.	60	125	250	300	500	1000	1250
Each	$1.55	1.95	2.50	2.80	3.00	4.00	4.75

4310D

4310E

4310F

4310D **FUNNELS, SEPARATORY.** Cylindrical with ground glass stopper and short stem. Type 7760.

Capacity, cc.	500	1000
Each	$3.75	4.90

4310E **FUNNELS, SEPARATORY.** Cylindrical, graduated, with long stem and ground glass stopper. Type 7765.

Capacity, cc.	125	250	500	1000
Each	$3.10	4.75	5.85	7.80

4310F **FUNNELS, SEPARATORY.** Globe shaped with ground glass stopper. Type 7770.

Capacity, cc.	30	60	125	250	500	750	1000	2000
Each	$1.45	1.55	1.95	2.35	2.85	3.25	4.00	6.50

FUNNELS

No. 4311B

No. 4311C

No. 4311 D

4311A **FUNNELS, SEPARATORY.** Same as Type 7770 but with air vent in stopper. Type 7775.

Capacity, cc.	125	250	500	1000	2000
Each	$2.50	3.00	3.60	5.00	7.75

4311B **FUNNELS, SEPARATORY.** For either separation in nickel determination; the outlet stem is moderately long and of small caliber so as to hold a column, specially designed for use in iron and steel laboratories. Type 7780. Capacity, 160 cc. Each ..... $ 2.70

4311C **FUNNELS, SEPARATORY.** For nickel determination as described in Blair's Analysis of iron and steel, 7th edition, page 191. Type 7785. Each 4.50

4311D **FUNNELS, SEPARATORY.** For sulphonation test of creosote, as used in the Forest Service of the U. S. Department of Agriculture, with graduated tube above the bulb. Capacity, 125 cc. Type 7790. Each 4.50

No. 4311E

No. 4311F

No. 4311G

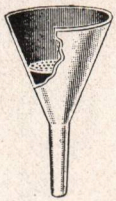
4311E **FUNNELS, SEPARATORY, SQUIBBS.** Pear shaped with ground glass stopper. Type 7795.

Capacity, cc.	125	250	500	1000	2000
Each	$2.35	3.45	4.30	6.50	10.50

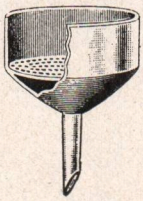
4311F **FUNNELS, STRAUSS.** For estimating lactic acid in gastric juice, with glass stopcock. Type 7800. Each ..... $ 1.90

4311G **FUNNELS, DROPPING, WALTER'S.** For examining single drops. Capacity, 60 cc. Type 7805. Each 2.25

FUNNELS



No. 4312B



No. 4312A

No. 4312C

4312A **FUNNELS, BUCHENER.** Porcelain, with fixed, perforated plate. Type 630, Coor's porcelain.

Size number	0	1	2	2a	3	4	4a	5
Diameter, mm	48	59	85	108	112	150	160	200
Each	.75	.90	1.50	1.95	2.10	3.60	4.20	5.40

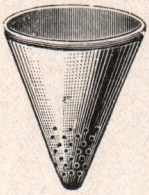
4312B **FUNNELS, HIRSCH.** Porcelain, with fixed, perforated plate. Type 640, Coor's porcelain.

Size number	000	00	0	1	2	3	4
Diameter, mm.	50	75	92	103	120	140	163
Each	.60	.75	.90	1.20	1.50	2.10	2.70

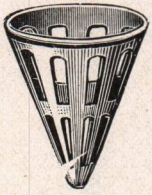
4312C **FUNNELS.** Agateware.

Capacity ....qts.	½ pt.	1 pt.	1 qt.	½ gal.	1 gal.
Each	$0.50	.60	.70	.90	1.15

No. 4312D



No. 4312E



No. 4312F

4312D **FUNNELS.** Hard rubber.

Capacity ....oz.	4	6	8	16	32
Each	$0.55	.60	.70	.90	1.15

4312E **FUNNELS.** Porcelain, perforated, small holes.

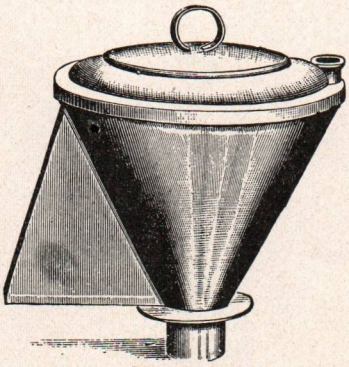
Diameter ....inches	4	5	6	8
Each	$0.65	.90	1.40	1.80

4312F **FUNNELS.** Porcelain, perforated, with large oval holes.

Diameter ....inches	4	5	6	8
Each	$0.65	.90	1.40	1.80

FUNNELS, GOOCH FILTERING. See Tubes.

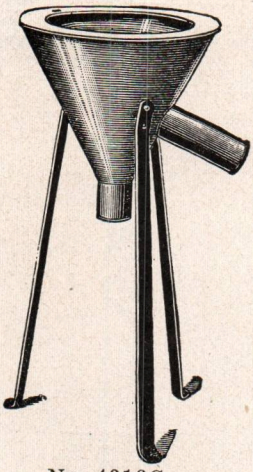
FUNNELS



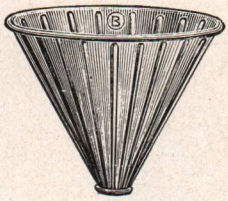
No. 4313A

4313A **FUNNELS, PLANTAMOUR'S.** Tin, for hot filtrations, 5¼ inches on top inside. Type 1520. Each ..... $ 5.25

4313B **FUNNELS, PLANTAMOUR'S.** Copper, for hot filtrations, 5¼ inches on top inside. Type 1521. Each 7.25



No. 4313C



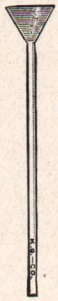
No. 4313D

4313C **FUNNELS.** Copper. Double wall on three iron legs. For hot filtrations; diameter, 6 inches. Type 1524. Each ..... $ 7.50

4313D **FUNNELS.** Copper-ribbed. For sugar analysis. Diameter 4 inches. Type 1518. Each 1.25

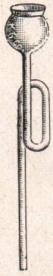
4313E **FUNNELS.** Heavy copper. Single wall with coil for hot water or steam; very desirable for the filtration of inflammable liquid. Type 1519. Each ..... $ 4.50

FUNNEL TUBES



No. 4314A

No. 4314B



No. 4314C

4314A **FUNNEL TUBES.** Straight with conical top.

Length, m/m	200	250	300	400
Each	$0.11	.12	.12	.14

4314B **FUNNEL TUBES.** Straight with thistle top. Type 7815.

Length, m/m	200	250	300	400
Each	$0.10	.11	.11	.12

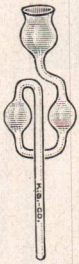
4314C **FUNNEL TUBES.** Thistle top with bent in stem. Type 7820.

Length, m/m	200	300	400
Each	$0.25	.25	.30

4314D **FUNNEL TUBE.** Same as Type 7820, but with conical top. Type 7825.

Length, m/m	200	300	400
Each	$0.28	.28	.33

No. 4314E



No. 4314G

4314E **FUNNEL TUBE.** Thistle top, with one loop and one bulb. Type 7830. Each ..... $ .32

4314F **FUNNEL TUBE.** Same as Type 7830, but with conical top. Type 7835. Each ..... .35

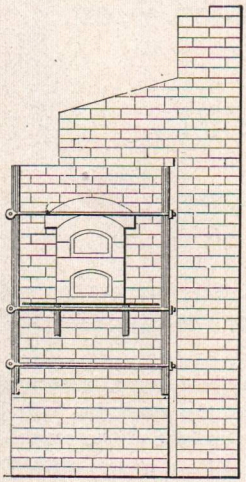
4314G **FUNNEL TUBES.** Thistle top, double loop and one bulb on each side. Type 7840.

Length, m/m	300
Each	$0.38

4314H **FUNNEL TUBES.** With bulb near top and short stem. Type 7845.

Length, m/m	300
Each	$0.42

MUFFLE FURNACES FOR COAL, COKE, WOOD OR OIL SECTIONAL FIRE CLAY TILE LINING



No. 4315A

4315A These tile-lined furnaces are to be recommended over anything in the market for an assay office having a sufficient volume of work to need a large furnace. They have been in use for a number of years, and a great many having been sold, there is no question as to the satisfaction and durability. As they are adaptable for any fuel, they are suitable for any region.

The lining of these furnaces is made of tiles, rabbetted to fit together properly, each tile being lettered and its location shown on the blue print which we supply with the furnace. It does not require an expert brick mason to build these furnaces, and they can be built much more quickly than if lined entirely with brick; furthermore, there is nothing left to the judgment of the brick mason, which might result in a very poor furnace if he is not experienced in furnace building.

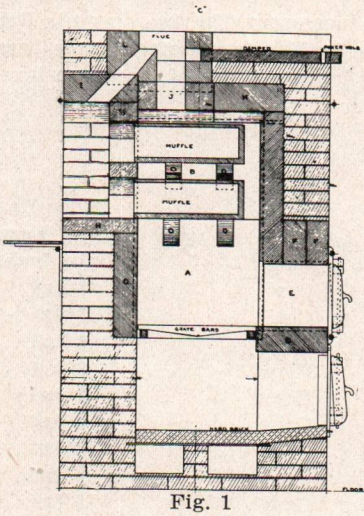


Fig. 1

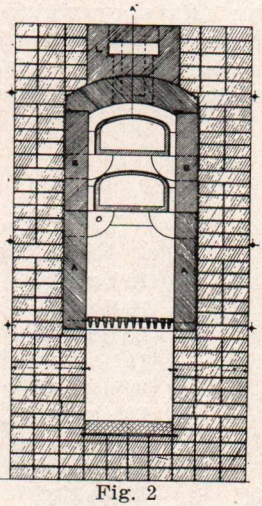


Fig. 2

The general arrangement of these furnaces is shown in the sectional views, Figures 1 and 2, the cuts being of the two-muffle back-fire furnace. The furnace fired from the back, that is, the side opposite the muffle opening, is to be preferred, as the distribution of the heat is more even. We can, however, supply them to fire from either side. The single-muffle furnace is identical with the two-muffle furnace, except for the omission of the lower muffle. The three-muffle furnace has the muffles arranged two below and one above in the centre. The regular pattern of this three-muffle furnace fires from either side, but it can also be supplied to be fired from the back.

MUFFLE FURNACES FOR COAL, COKE, WOOD OR OIL

No. 4316A

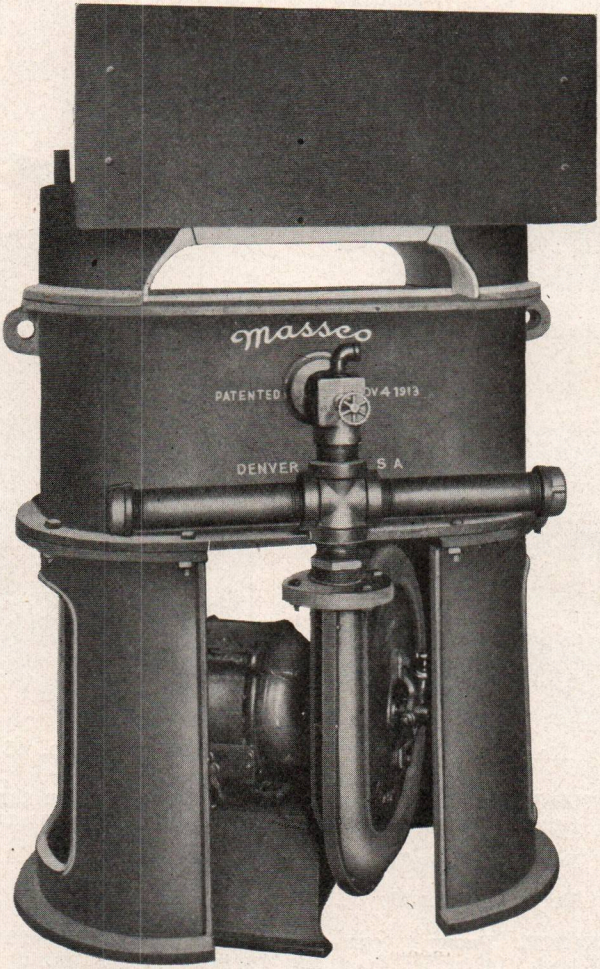
SECTIONAL FIRE CLAY TILE LINING

The coke furnace is only made in a single muffle size . The furnaces for wood and for oil are quite similar to the coal furnaces, proper changes being made in the fire box to adapt them to the different fuel.

These furnaces are jacketed with red brick, and the entire furnace is securely bound with angle irons and tie rods. We recommend that the stack be built at the side of the furnace, as it is not best to place the heavy weight of the stack on the furnace proper. The stack should be lined for some little distance with fire brick, for the heat in the stack may be too high for common brick, the fire brick for the stack, and the red brick for the stack and furnace jacket, are not supplied; but the price includes everything else necessary The fire clay tile lining for the furnace and for the short diagonal flue leading to the stack, grate bars with support bars, angle irons and tie rods, fire boxes and ash pit doors, an iron shelf with brackets (for the front of the furnace), etc,

Size for	Muffle Size	Fuel	Floor Space Approx. Furnace Only, Inches	Price
Two "NN'	10½x19x6½	Coal	3'6x4'	$ 90.00
One "NN"	10½x19x6½	Coal	3'6x4'	85.00
Three "NN"	10½x19x6½	Coal	3'6x4'	100.00
Two "NN"	10½x19x6½	Wood	3'6x4'	90.00
One "NN"	10½x19x6½	Wood	3'6x4'	85.00
One "NN"	10½x19x6½	Coke	3'6x4'	85.00
Two "QQ"	12½x19x7¾	Coal	3'8x4'	100.00
One "QQ"	12½x19x7¾	Coal	3'8x4'	85.00
Three "QQ"	12½x19x7¾	Coal	3'8x4'	100.00
Two "QQ"	12½x19x7¾	Wood	3'8x4'	100.00
One "QQ"	12½x19x7¾	Wood	3'8x4'	85.00
One "QQ"	12½x19x7¾	Coke	3'8x4'	90.00
Two "UU"	14x19x7¼	Coal	3'9x4'	110.00
One "UU"	14x19x7¼	Coal	3'9x4'	90.00
Two "UU"	14x19x7¼	Wood	3'9x4'	110.00
One "UU"	14x19x7¼	Wood	3'9x4'	90.00
One "UU"	14x19x7¼	Coke	3'9x4'	100.00

Massco FORGE LOW PRESSURE OIL
FOR HEATING DRILL STEEL



No. 4317A

4317A The *Massco* Oil Forge for Drill Steel and other forge work includes the forge body—the Oil Burner—the Blower with direct connected Motor and Oil Tank.

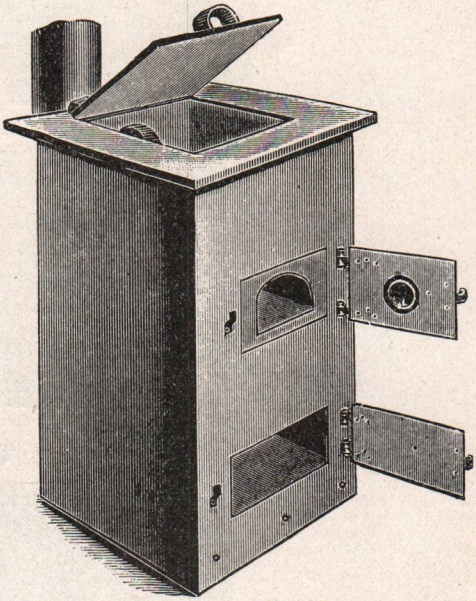
Size of opening, 20x3-inch. Price, complete, F. O. B. Denver.....$350.00
Cal also supply with High Pressure Burner to connect to Air Compressor 200.00

Shipping weight, Forge, 1,250 lbs. Shipping weight, Motor Blower, 225 lbs. Floor space, 26x30 inches.

Special sizes built to order. We also make blower for belt drive.

ASSAY FURNACES

No. 4318A



No. 4318B

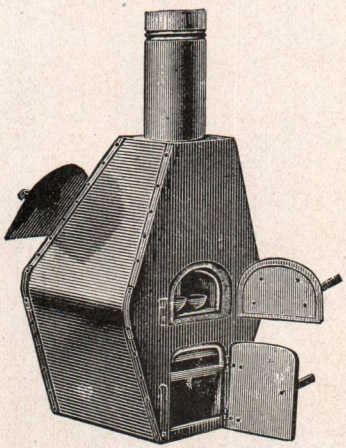
4318A **FURNACE.** Our own manufacture. Of fire clay, in three sections, securely bound with iron bands, with one muffle.

For 9x15 muffle $60.00

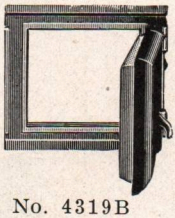
For 10x16 muffle 60.00

4318B **FURNACE.** Brown's, our own manufacture. Size, 29 inches high, 14 inches deep and 16 inches wide; taking muffle 12x6x4 inches. The best and cheapest furnace made, having no complicated parts to get out of order; it can be used both for muffle work and for crucible operations. There is no other furnace manufactured of similar dimensions and weight which can accommodate such large muffles, and consequently produce so much work and so rapidly. Being made of heavy sheet iron, it cannot be broken by handling nor injured by heating. Boxed, this furnace weights 175 pounds, as against 250 to 400 pounds of other furnaces. This furnace is from one-third to two-thirds cheaper than any other furnace which will do equally good work. Price, packed for shipment, with one muffle.. 35.00

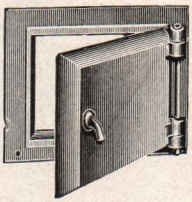
ASSAY FURNACES



No. 4319A



No. 4319B



No. 4319C

4319A **FURNACE, No. 1 ASSAY, "MASSCO."** A very complete and satisfactory portable furnace. Made of fire clay in one piece, and securely bound with steel; doors asbestos lined; weight, 100 pounds, taking muffle 6x12x4 inches. With one muffle $35.00

4319B **FURNACE DOORS.** Heavy iron frame and door with fire clay lining, inside measurements, 11 inches high, 13 inches wide. Has lugs on the frame, so that it is supported and clamped to place by the binding rods of the furnace, no anchor bolts being necessary.
Each 7.50
Extra fire clay lining 1.00

4319C **FURNACE DOORS.** With heavy iron frame and door without linings; inside measurements, 11 inches high, 13 inches wide. This door has four holes in the frame for anchor bolts ..... net each 7.50
When ordered specially, this door can be lined with fire clay tile lining, at 50 cents extra.

FURNACE DOORS. See also Muffle Doors.

No. 4319D

4319D **FURNACE GRATE BARS.** Of cast iron.

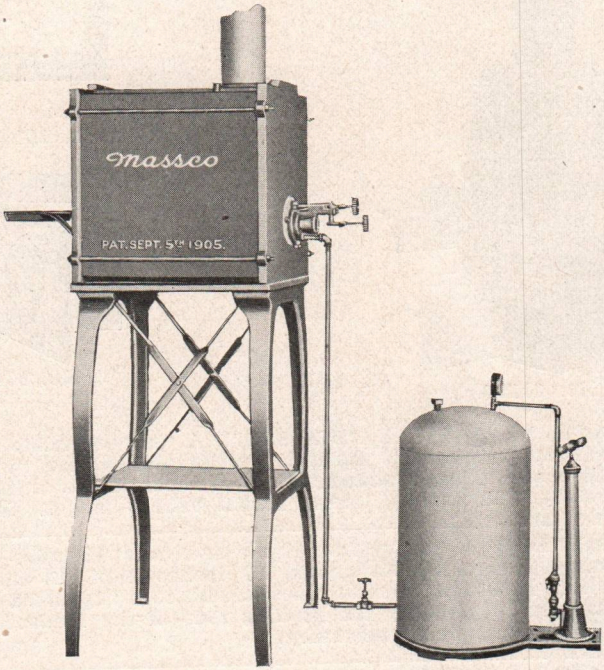
Length ..inches	12½	14	16	18	20	22	24	25	27	30
Each, net.....	$0.25	.30	.35	.40	.45	.50	.55	.60	.70	.75

Note—In estimating number required to cover fire box surface, figure each complete bar 2½ inches wide.

FURNACE BLOWERS. See Blower.

FURNACE POKERS. See under Pokers.

Massco MUFFLE FURNACES



No. 4320A No. 4320B

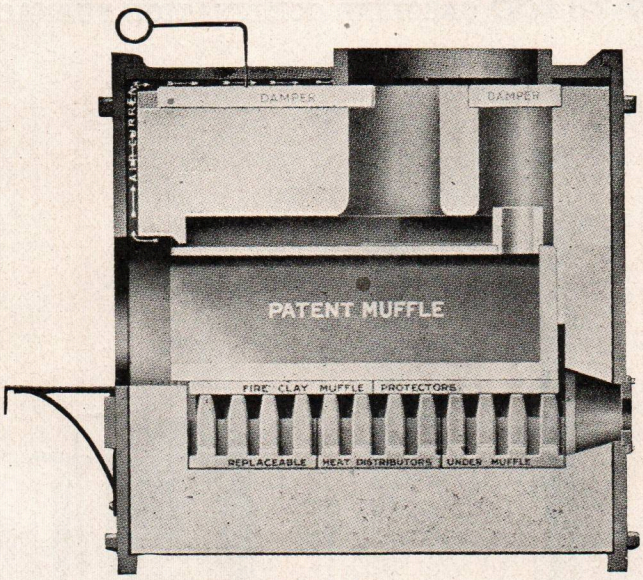
4320A *Massco* Muffle Furnaces are designed to meet the needs of a furnace simple and practical and giving an even heat, high or low, oxidizing, or reducing, as required. They are heated quickly, and are convenient, clean and efficient in operation. The capacity for crucibles and scorifiers is great, as the muffles are of the square high shouldered type, with every bit of the space available, permitting the use of larger crucibles.

4320B The Burners (for gasoline), which we recommend to heat these furnaces, have proven themeselves to be very efficient, giving high heat with a minimum expense for fuel, on account of the perfect combustion of the gases.

4320C Sufficient space is allowed within the furnace for proper combustion, and as the walls are thick, the heat is given to the muffle with small loss to radiation, etc. The furnaces are made of strong, thoroughly burned material, and have good lasting qualities.

More specific informaation concerning gas or oil furnaces will be given upon request.

Massco GAS AND GASOLINE FURNACES



No. 4321A

4321A **Massco MUFFLE FURNACE** (Prospector's size). Type 112....$ 50.00
Size of muvle, 6x6½x4¼ in. Capacity, four 10-gramme crucibles. Exterior dimensions, 9x10x10 in. Two-gallon gasoline tank. Net weight of furnace, 39 lbs. This little equipment will be found convenient where it is necessary to reduce bulk and weight to a minimum. Approximate shipping weight: Furnace body, 95 lbs., Tank, 55 lbs.

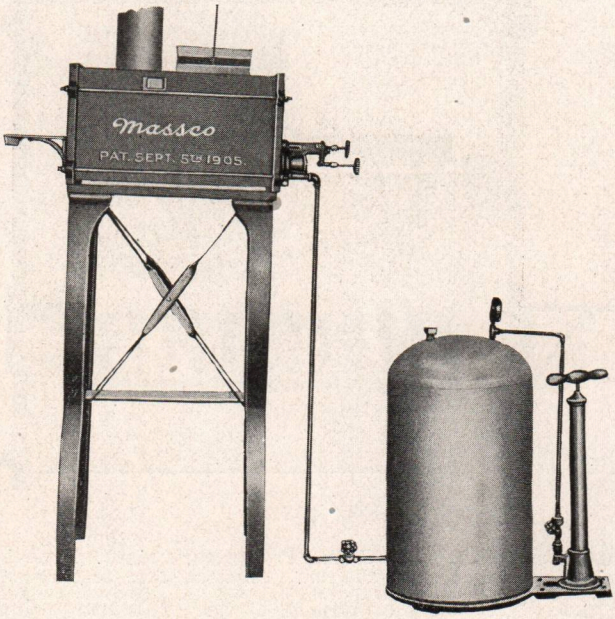
4321B **Massco MUFFLE FURNACE.** Type 122..... 92.50
Size of muffle, 6x10x4¼ in. Capacity, six 10-gramme crucibles. Price includes Furnace, Iron Stand, Burner, eight-gallon Gasoline Tank. Price for Furnace Body only, ... Approximate shipping weight: Furnace Body, 300 lbs. Tank, 75 lbs. Stand, 125 lbs.

4321C **Massco MUFFLE FURNACE.** Type 132..... 105.00
Size of muffle, 8x12x5¼ in. Capacity, eight 12 or 15-gramme crucibles, six 20-gramme crucibles. Price includes Furnace, Iron Stand, Burner, eight-gallon Gasoline Tank. Price for Furnace Body only, ... Approximate shipping weight: Furnace Body, 450 lbs. Tank, 75 lbs. Stand, 135 lbs.

4321D **Massco MUFFLE FURNACE.** Type 142..... 125.00
Size of muffle, 10x16x5½ in. Capacity, fifteen 15-gramme crucibles, twelve 20-gramme crucibles. Price includes Furnace, Iron Stand, Burner, eight-gallon Gasoline Tank. Price of Furnace Body only, ... Approximate shipping weight: Furnace, 675 lbs. Stand, 160 lbs. Tank, 75 lbs.

4321E **Massco MUFFLE FURNACE.** Type 152..... 150.00
Size of muffle, 14x18x6½ in. Capacity, twenty 15-gramme crucibles, twenty 20-gramme crucibles. Price includes Furnace, Iron Stand, Burner, eight-gallon Gasoline Tank. Price of Furnace Body only, ... Approximate shipping weight: Furnace, 900 lbs. Stand, 200 lbs. Tank, 75 lbs.
On all of above Furnaces (except Type 112), an allowance of $10.00 is made if iron stand is not desired.

Massco GASOLINE COMBINATION FURNACES



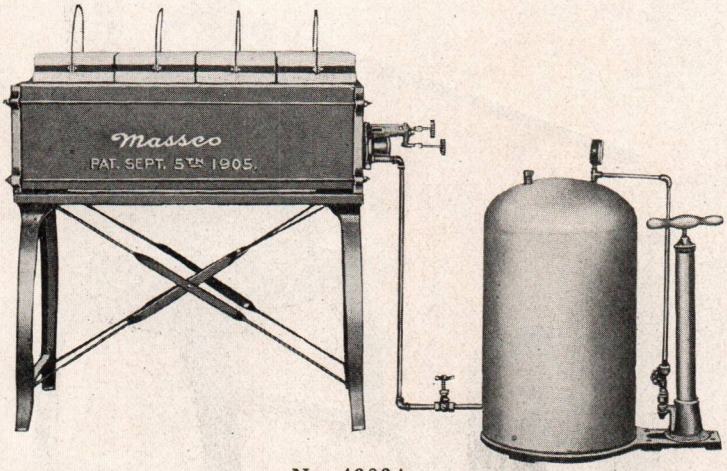
No. 4322A

4322A *Massco* **COMBINATION FURNACE.** Type 30 ..... $ 90.00
Size of muffle, 6x8x3½ in.
Capacity, 2 "G" or 20-gramme crucibles. Gross weight, 235 lbs. Price includes 1½-inch gasoline Burner, 4-gallon Tank, with pump and pipe.

4322B *Massco* **COMBINATION FURNACE.** Type 31 ..... 100.00
Size of muffle, 6x8x3½ in.
Capacity, 4 "G" or 20-gramme crucibles. Gross weight, 260 lbs. Price includes 1¾-inch gasoline Burner, 4-gallon Tank, with pump and pipe.

4322C *Massco* **COMBINATION FURNACE.** Type 32 ..... 110.00
Size of muffle, 6x8x3½ in.
Capacity, 8 "F" or 20-gramme crucibles. Gross weight, 290 lbs. Price includes 2¼-inch gasoline Burner, 8-gallon Tank, with pump, gauge and pipe.
Deduct $10.00 from price if Stand is not wanted. Weights given above include Iron Stand.

Massco GASOLINE CRUCIBLE FURNACES



No. 4323A

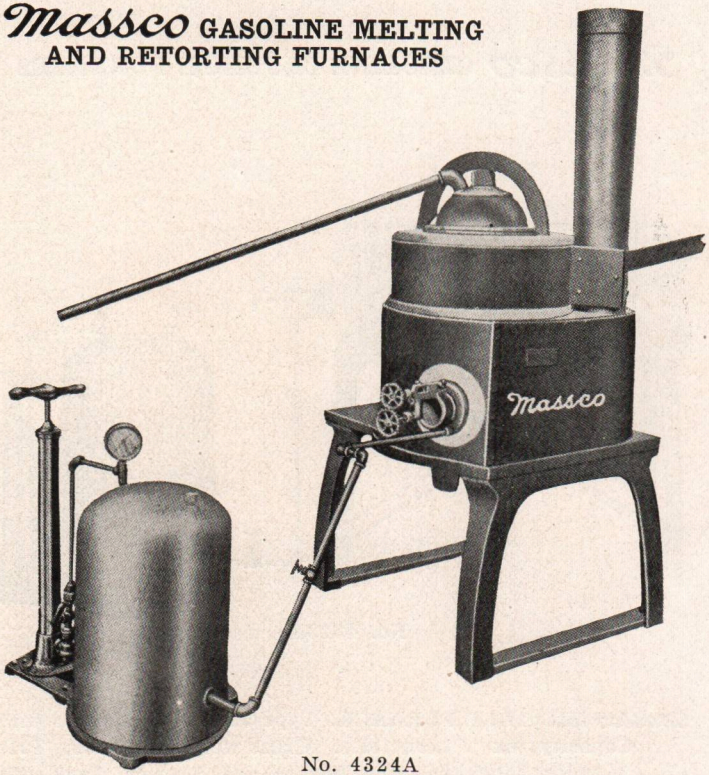
4323A **Massco CRUCIBLE FURNACE.** Type 51 ..... $ 90.00
Capacity, six "J" crucibles. Gross weight, 220 lbs. Price includes 2-inch gasoline Burner and 8-gallon Tank, with pump, gauge and pipe.

4323B **Massco CRUCIBLE FURNACE.** Type 61 ..... 95.00
Capacity, eight "F" or 20-gramme crucibles. Gross weight, 180 lbs. Price includes 1¾-inch gasoline Burner and 8-gallon Tank, with pump, gauge and pipe.

4323C **Massco CRUCIBLE FURNACE.** Type 71 ..... 100.00
Capacity, twelve "F" or 20-gramme crucibles. Gross weight, 250 lbs. Price includes one gasoline Burner, 2¼-inch, and 8-gallon Tank, with pump, gauge and pipe.

4323D **Massco CRUCIBLE FURNACE.** Type 81 ..... 100.00
Capacity, 16 "F" or 20 gramme crucibles. Gross weight, 300 lbs. Price includes 2½-in. gasoline Burner and 8-gallon Tank, with pump, gauge and pipe.
Deduct $10.00 from price, if stand is not wanted.
Weights given above include Iron Stand.

Massco GASOLINE MELTING AND RETORTING FURNACES



No. 4324A

4324A The flame blow-in is located so that the flame enters the furnace on a tangent and does not hit the crucible until there is complete combustion. The hot gases circle around the crucible, thereby preventing the loss of crucibles by cracking, and saving their wear and tear to such an extent that their life is lengthened several melts. This furnace is made in three sections, or practically divides in the center, so when th eupper ring is lifted off it leaves the upper portion of the crucible so exposed that it can be removed with basket tongs.

The illustration shows the Furnace for bullion melting and also as used for retorting amalgam, using a special fire clay ring in which the Nevada style of retore fits. It is the most effcient and convenient Furnace for retorting and melting bullion yet devised, and indispensable to amalgamation mills.

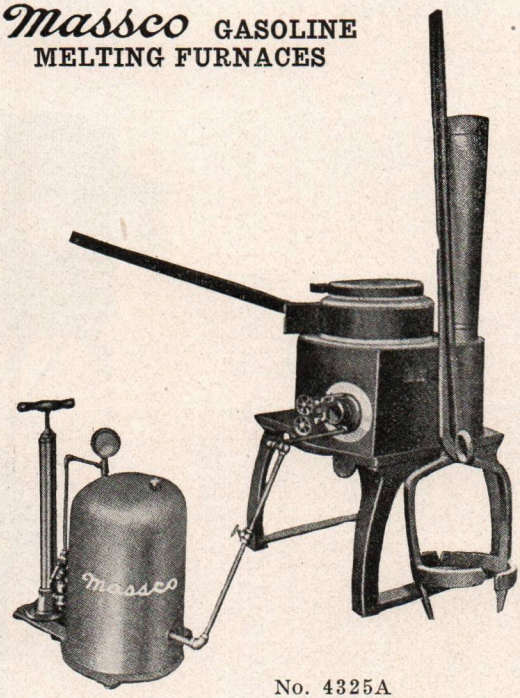
4324B The Colorado Furnaces of the following sizes are especially suited to the melting of cyanide precipitates, bullion, brass, etc., and to the retorting of amalgam. The flame is thrown in tangentially and swirls around the crucible instead of striking it directly, thus heating it more evenly and prolonging its life as it is relieved of the liability of cracking due to uneven strains.

4324B Sizes Nos. 41, 42 and 43 are made of three parts, viz.: The lower or main body; the ring, which, when removed, exposes the crucible down to the bilge so that it is gripped easily with tongs and removed; and the cover.

Sizes Nos. 44, 45 and 46 are made in two pieces: The main body and the cover. Sufficient room has been allowed around the crucible for the insertion of tongs and the ready removal of the crucible.

The crucible is set upon a replacable stool, which exposes the bottom to be heated.

Massco GASOLINE MELTING FURNACES



No. 4325A

4325A **BULLION FURNACE.** Type 200 ..... $ 70.00
Holds black lead crucible No. 7. Crucible compartment, Diameter, 6 in.; depth, 9 in. Price includes DFC Gasoline Burner, and 4-gal. Blowpipe Tank. Weight, packed for shipment, 200 pounds.

4325B **BULLION FURNACE.** Type 220 ..... 80.00
Holds black lead crucible, No. 25. Crucible compartment, Diameter, 10 in.; depth, 13½ in. Price includes 2-inch DFC Gasoline Burner, and 8-gal. Blowpipe Tank. Weight, packed for shipment, 250 pounds.

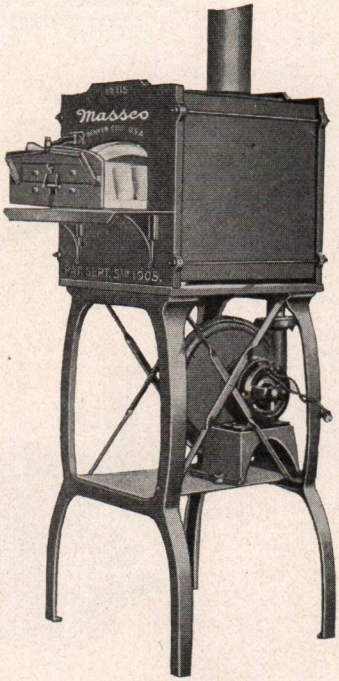
4325C **BULLION FURNACE.** Type 230 ..... 100.00
Holds black lead crucible No. 45. Crucible compartment, Diameter, 13 in.; depth 17 in. Price includes DFC Gasoline Burner, 2¼ in., and 8-gal. Blowpipe Tank. Weight, packed for shipment, 450 pounds.

4325D **BULLION FURNACE.** Type 240 ..... 125.00
Holds black lead crucible No. 80. Crucible compartment, Diameter, 18 in.; depth 19½. Price includes two DFC Gasoline Burners, 2¼ in., and 8- gal. Blowpipe Tank. Weight, packed for shipment, 800 pounds.

4325E **BULLION FURNACE.** Type 250 ..... 175.00
Holds black lead crucible No. 100. Price includes two DFC Gasoline Burners, 2½ in., and 15-gal. Blowpipe Tank. Weight, packed for shipment, 1,000 pounds.

Prices include Furnace and Iron Stand. Deduct $10.00 if stand is not wanted. Can also supply this type of Furnace equipped for burning Gas. Send for price.

Massco GAS MUFFLE FURNACES



No. 4326A

Prices include Furnace, Iron Stand, Motor, Blower and Burner.

Floor space dimensions signify all space necessary for complete installation of furnace in running order.

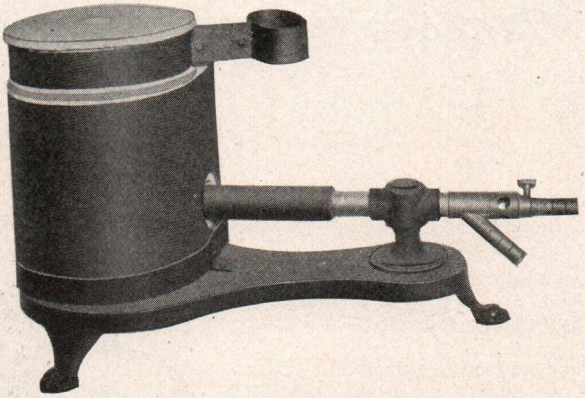
4326A **Massco MUFFLE FURNACE.** Type 125 ..... $132.50
Size of muffle 6x10x4¼ in.
Capacity, six 10-gramme crucibles.
Shipping weight, 225 lbs.; iron stand, 120 lbs.; Motor-blower, 150 lbs.; floor space, 16x20 in.

4326B **Massco MUFFLE FURNACE.** Type 135 ..... 140.00
Size of muffle 8x12x5¼ in.
Capacity, eight 12 or 15-gramme, or six 20-gramme crucibles.
Shipping weight, 400 lbs.; iron stand, 130 lbs.; motorblower, 150 lbs.; floor space, 18x23 in.

4326C **Massco MUFFLE FURNACE.** Type 145 ..... 165.00
Size of muffle 10x16x5½ in.
Capacity, fifteen 15-gramme, or twelve 20-gramme crucibles.
Shipping weight, 620 lbs.; iron stand, 140 lbs.; motorblower, 150 lbs.; floor space 21x26 in.

4326D **Massco MUFFLE FURNACE.** Type 155 ..... 185.00
Size of muffle 14x18x6½ in.
Capacity, twenty 15-gramme or 20-gramme, or twenty-four 12-gramme crucibles.
Shipping weight, 855 lbs.; iron stand, 180 lbs.; motorblower, 150 lbs.; floor space, 24x29 in.
If Iron Stand is not wanted, deduct $10.00.

Massco MELTING FURNACES



No. 4327A

4327A These furnaces have found favor with jewelers and others requiring a small furnace, capable of high temperatures, for melting gold, silver, etc. The flame enters tangentially and swirls around the crucible instead of striking it directly, thus heating it ore evenly and relieving it of unnecessary strains and prolonging its life. The crucible may be removed readily, ample room for tongs being allowed. The larger sizes of the furnaces consist of three pieces. The bottom or main body; the ring, which, when removed, exposes the bilge of the crucible to facilitate gripping it with tongs; and a cover. They are made of a mixture to stand the severe strains of expansion and contraction and are substantially bound with iron.

4327B **MELTING FURNACE.** Type 10 (gas only), complete ..... $ 8.00
Taking No. 1 black lead or Massco Clay crucibles up to 20 grammes. Net weight, 7 lbs.; shipping weight 10 lbs.

PARTS:—Furnace body 2.50
Furnace body and cover 1.00
Gas burner alone 2.75
Stand, without burner 2.50

4327C *Massco* **MELTING FURNACE.** Type 20 (gas only), complete 10.00
Taking No. 3 black lead, Massco Clay crucibles up to "G." Net weight, 20 lbs.; shipping weight, 27 lbs.

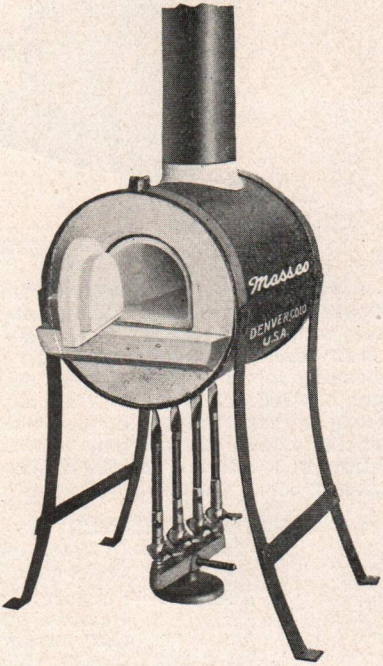
PARTS:—Furnace body 5.00
Furnace body and cover 6.00
Gas burner alone 2.75
Can be used with Gasoline Burner 10.00
Stand 3.50

4327D *Massco* **MELTING FURNACE.** Type 30. With Gasoline Burner 18.00
Taking No. 7 black lead crucible. Net weight, 40 lbs.; shipping weight 50 lbs.

PARTS:—Furnace body 10.00
Furnace body and cover 11.25
Burner 3.50
Ring 1.00
Stand 5.00

Massco GAS MUFFLE FURNACE

This is a very convenient gas furnace where a small muffle is desired. It is heated by four Bunsen burners, mounted on one base, each equipped with wing-tops to spread the flame uniformly. A very satisfactory and efficient furnace for ash determinations. It is especially recommended for flour mills and also for baking inlays in manufacturing jewelry. We make this furnace in two sizes.



No. 4328A

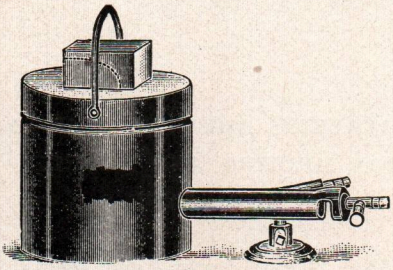
4328A *Massco* **MUFFLE FURNACE.** Type 473. Muffle 6½x4x2½ inches, complete, with burners $18.00

Extra Muffles ..... .60

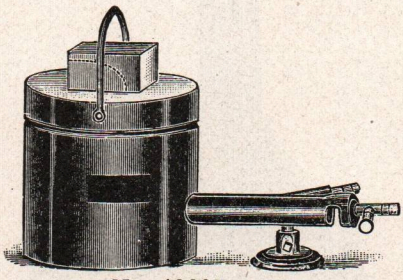
4328B *Massco* **MUFFLE FURNACE.** Type 483. Muffle 10x6x4 inches, complete, with burners 30.00

Extra muffles ..... .75

GAS FURNACES



No. 4329A



No. 4329B

FLETCHER'S CRUCIBLE FURNACE WITH INJECTION GAS BURNER, TYPE 40A

4329A The burner is almost noiseless in operation, and works with a very small supply of gas, producing much more economical results than any gas burner heretofore used for the purpose of heating furnaces. Gas supply pipe required, ⅜-inch. Will operate with illuminating gas, natural gas or gasoline gas, without alteration. The amount of air and gas used by this furnace is very small. Outside dimensions of clay parts, 4⅛x5⅜ inches high; pot inside, 2⅝-inch diameter by 2½ inches deep. Furnace on stand, 6½ inches high over all.

Price	net	$5.50
Parts—Furnace Body		1.50
Furnace Body and Cover		2.80
Burner, alone		2.50
Stand, without Burner		1.25
Crucibles, 2¼x2inches	each	.15

4329B For metallurgists, jewelers, chemists, manufacturers of iron and brass castings, and other purposes where an ordinary furnace is useless or unrelable, this furnace founded on the well-known Injector Furnace, is without question the best and simplest gas furnace made. The burner is in one casting, and the nozzle does not readily become over-heated.

Type 41 Pot and Cover, dimensions: outside, 6½ inches diameter by 7¼ inches high; inside, 3½ inches deep by 3½ inches diameter. Capacity 1-12 gm. Clay or 1, No. 4/0 Black Lead Crucible.

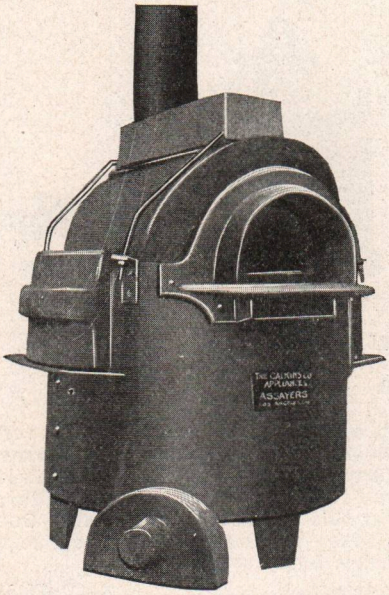
Type 41A Pot and Cover, dimensions: outside, 9 inches diameter by 10 inches high; inside, 5½ inches deep by 4¾ inches diameter. Capacity 1, No. F Clay or 1, No. 3 Black Lead Crucible.

Crucible Furnace, Type 41	$ 7.50
Crucible Furnace, Type 41A	10.50

PRICES FOR SEPARATE PARTS

4329C	Type 41 Furnace Body	3.50
	Type 41 Furnace Body, Cover and Dome	4.50
	Type 41A Furnace Body	5.00
	Type 41A Furnace Body, Cover and Dome	6.50
	Type 41 or 41A Crucible Support	.25
	Type 41 Burner	3.25
	Type 41A Burner	4.50

ADVANCE COMBINATION FURNACES



No. 4330A

THE CALKINS ADVANCE COMBINATION MELTING AND MUFFLE FURNACE. TYPE 3.

4330A Same design and general construction as furnaces Types 5 and 10, and intended for the use of prospectors and examining engineers. Dimensions: 11 inches outside diameter by 19 inches high. Crucible chamber 7 inches diameter by 6 inches high. Muffle, 3x4¾x7 inches. Weight, 50 pounds.

Price .....net $18.00

THE ADVANCE COMBINATION MELTING AND MUFFLE FURNACE TYPE 5

4330B This No. 5 combinatiion furnace was especially designed to meet the demands of such engineers and assayers who find it advisable or necessary to complete their tests on the property under examination. Holds five 20-gram crucibles in the crucible chamber. The muffle will accommodate 12 or more cupels at one time.

The amount of gasoline needed to operate this furnace to its full capacity will not exceed one-half of a gallon per hour.

One burner furnishes ample heat for melting and cupelling simultaneously. The flame from the burner is not, as in other assay furnaces, injected against the crucibles but is injected into the crucible chamber at a point tangent to the inner circumference and impinges on the circular wall and swirls around the crucibles. This manner of firing saves the crucibles; as any competent assayer knows that it is very destructive to crucibles to play a hydro-carbon flame directly upon them.

Furnace measures 14 inches outside diameter and 20 inches high over all; the crucible chamber is 8 inches inside diameter, 6 inches high in the clear; the muffle is 3x4¾x8 inches; weight 85 pounds.

The "Challenge" Hydro-Carbon Burner is especially adapted for use with this furnace.

Price .....net $23.50

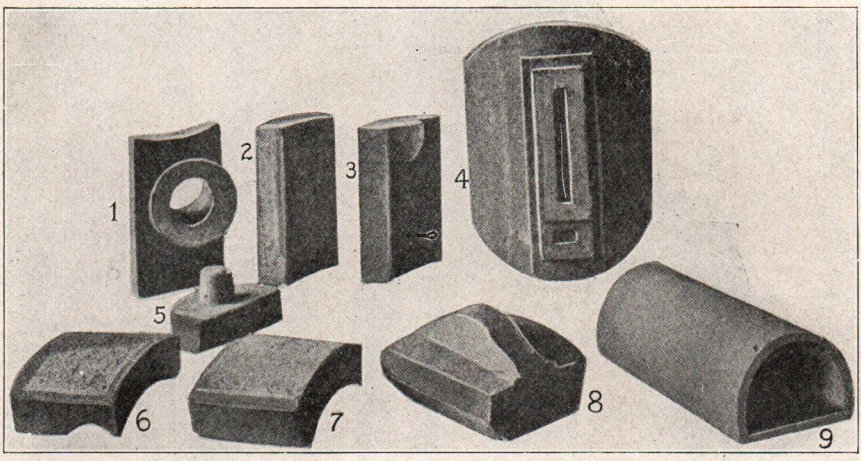
THE CALKINS ADVANCE COMBINATION MELTING AND MUFFLE FURNACE. TYPE 10.

4330C Same in construction as the Type 5. This furnace holds ten 20-gram crucibles in the melting chamber. Muffle measures 4x6x12 inches and will accommodate eighteen 1½-inch cupels. Operated by "Challenge" Burner. Weight, 180 lbs.

Price .....net $28.50

ADVANCE COMBINATION FURNACES

EXTRA PIECES OF FIRE BRICK LINING



No. 4331A

TYPE 3 FURNACE

Types 1, 2, 3, 6 and 7 combined	$3.00
Type 4, Dome	5.00
Type 5, Muffle Plug	.30
Type 8, Door	.50
Type 9, Muffle	.75

TYPE 5 FURNACE

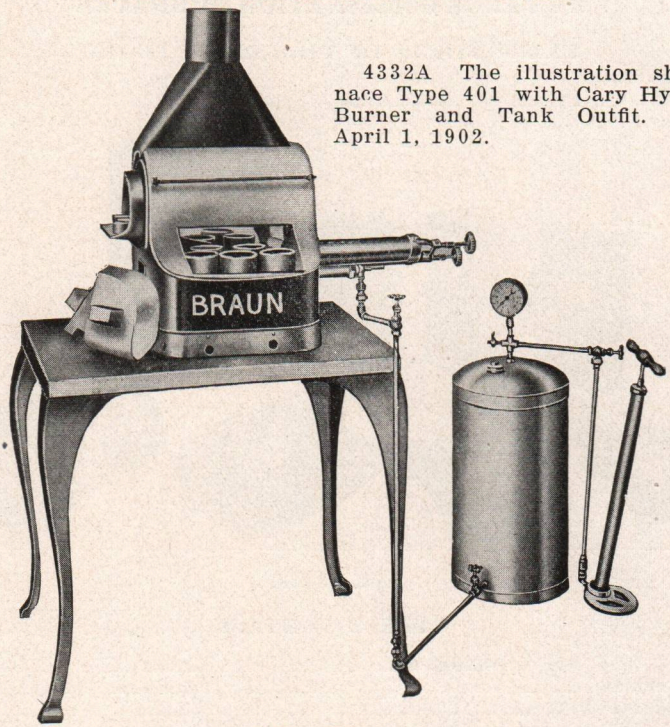
Type 1, Burner Hole Brick	1.25
Type 2, Front Brick	.65
Type 3, Back Brick	.75
Type 4, Dome	6.00
Type 5, Muffle Plug	.30
Type 6, Side Brick Near Burner	.50
Type 7, Side Brick	.50
Type 8, Door	.65
Type 9, Muffle	.75

TYPE 10 FURNACE

Type 1, Burner Hole Brick	1.50
Type 2, Front Brick	.75
Type 3, Back Brick	1.00
Type 4, Dome	7.00
Type 5, Muffle Plug	.40
Type 6, Side Brick Near Furnace	.60
Type 7, Side Brick	.60
Type 8, Door	.75
Type 9, Muffle	.90

N. B. In ordering, please state the number of furnace.

BRAUN COMBINATION FURNACES



4332A The illustration shows Furnace Type 401 with Cary Hydrocarbon Burner and Tank Outfit. Patented April 1, 1902.

No. 4332A

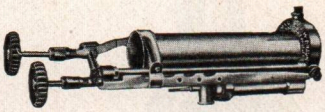
ROTARY FLAME COMBINATION FURNACES

These furnaces are constructed in such a manner that the muffle is placed above the crucible compartment, and in this respect differs from our other types of combination muffle and crucible furnaces. In this furnace a large crucible compartment is obtained, and the different portions of this compartment are, to a limited extent, of different temperatures.

The burner hole opening of the furnace is located in the centre of one side, and the flame from the burner is forced toward the opposite wall of the furnace where it is deflected to both sides of the chambed by a brick of special shape, which forces the flame in a rotary motion around both sides of the crucible compartment. This brick is always in the hottest part of the flame, thus saving the fire clay lining of the furnace, and, being separate, can easily be replaced at a slight cost.

Each cover for the crucible compartment is made in two sections, so that they may easily be removed. The draft for cupellation is obtained through an opening about 1¼ inches in diameter made in the jacket and lining at a point opposite the hole in the rear end of the muffle, and the amount of air admitted to the muffle is controlled by a slide fitted to the jacket. An opening larger than the inlet is provided just inside of the jacket and directly over the open end of the muffle. This outlet is opened and closed by withdrawing or inserting the fire clay muffle plug. The heat rising from the crucible chamber creates by suction a draft through the full length of the muffle when the inlet and outlet apertures are open, thus securing rapid cupellation. The jacket of this furnace is made of sheet iron. Agents for Braun Laboratory Appliances.

BRAUN COMBINATION FURNACES



No. 4333A

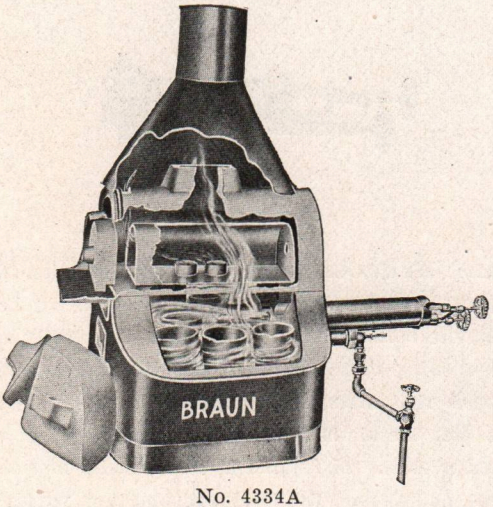
4333A The **CARY HYDROCARBON BURNER** is scientifically constructed so that the fuel and air are mixed in proper proportions an heated to the right temperature for complete combustion. The burner fits tightly against the special boss in the Burner opening of the furnace and thus all o fthe air entering the furnace passes through the mixing tube of the Burner. The mixing tube is of such size and shape that the air is drawn into it by the jet of vaporized gasoline and thoroughly mixed with it. The flame is clean, emits no poisonous or noxious fumes, and is almost noiseless. The fuel consumption varies with the size of the Burner and the air pressure used. The best results are obtained with from 35 to 40 pounds pressure in the fuel tank.

The difficulties encountered in generating other burners are overcome in this by the use of a separate valve and trough. Generation is accomplished by permitting a small quantity of gasoline to flow into this trough and igniting. The flame envelops the burner and quickly heats it to a temperature which permits opening the main needle valve and allowing the flame to be directed into the furnace.

Furnace outfits are furnished complete as shown including: Furnace with one muffle, covers, hood and two lengths of stovepipe, Cary Burner, gasoline tank with pump, pressure gaugs, 12 feet of ¼-inch iron pipe, two swivel joints, valves and fittings, and iron stand.

Complete Outfit	Type 421	Type 411	Type 401
Furnace Capacity Crucibles	6-F or 4-G	8-F or 6-G	10-F or 6-G
Muffle dimensions	4¾x8x3 in.	6x9x4 in.	6x10x4 in.
Cary Burner, size	1½ in.	1¾ in.	2 in.
Weight, net	205 lbs.	235 lbs.	270 lbs.
Weight, packed	310 lbs.	340 lbs.	430 lbs.
Price	$80.00	$86.00	$92.50

BRAUN COMBINATION FURNACES



No. 4334A

OPEN VIEW ROTARY FLAME TYPE COMBINATION FURNACE

4334A The following data refers to the various parts of the complete outfits, which are supplied separately when desired.

	Weight Net	Weight Packed	Price
Furnace for Outfit, Type 421	87 lbs.	115 lbs.	$20.00
Furnace for Outfit, Type 411	116 lbs.	145 lbs.	25.00
Furnace for Outfit, Type 401	155 lbs.	235 lbs.	30.00
Cary Burner, 1½ in.	3⅞ lbs.	5 lbs.	13.00
Cary Burner, 1¾ in.	4⅛ lbs.	6½ lbs.	14.00
Cary Burner, 2 in.	4¾ lbs.	7 lbs.	15.50
Tank Outfit, Type 1007	45 lbs.	70 lbs.	35.00
Iron Stand	65 lbs.	115 lbs.	12.00

RENEWAL PARTS

Type	401	411	421
Hood	$ 2.00	$ 2.00	$ 1.50
Covers, per cent of 2	2.00	1.25	1.00
Burner Hole Boss A	.25	.25	.25
Muffle Plug B	.30	.30	.....
Dome C	10.00	8.00	7.00
Side Bricks below Covers, per set of 4	4.50	4.50	4.00
End Bricks, with Muffle Rests, per set of 2	4.00	3.50	3.00
Deflecting Bricks	.50	.50	.50
Bottom Brick M	2.00	1.75	1.50
Muffle	1.35	1.35	1.15
Jacket, Sheet Iron	10.00	9.00	9.00

Furnace Blowers. See Blowers.

Prices net F. O. B. Denver, Salt Lake, El Paso or Los Angeles.

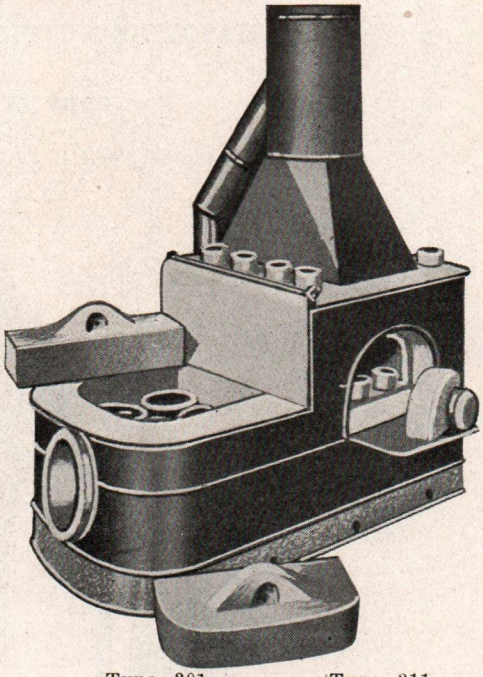
Agents for Braun Laboratory Appliances.

CARY COMBINATION FURNACES

GASOLINE COMBINATION FURNACES, CARY TYPE

Specifications, Complete Outfits

4335A The complete outfits as illustrated include: Furnace with covers, one muffle, hood with draft attachment and two lengths of stovepipe; Cary Burner; gasoline tank with pump, pressure gauge, 12 feet of ¼-inch pipe, swivel joints, valves and fittings, and large iron stand.



No. 4335A

Complete Outfits	Type 301	Type 311
Furnace capacity, crucibles	4-F	6-F
Muffle dimensions	6x9x4 in.	7x12x4½ in.
Cary Burner, size	2 in.	2¼ in.
Weight, net	275 lbs.	340 lbs.
Weight, packed	415 lbs.	515 lbs.
Price	$87.50	$91.50

The following data refers to the various parts of the complete outfits, which are supplied separately when desired.

	Weight Net	Weight Packed	Price
Furnace for Out, Type 301	160 lbs.	220 lbs.	25.00
Furnace for Outfit, Type 311	225 lbs.	315 lbs.	27.50
Cary Burner, 2 in.	4¾ lbs.	7 lbs.	15.50
Cary Burner, 2¼ in.	5⅝ lbs.	7½ lbs.	17.00
Tank Outfit Type 1007	45 lbs.	70 lbs.	35.00
Iron Stand	65 lbs.	115 lbs.	12.00

RENEWAL PARTS

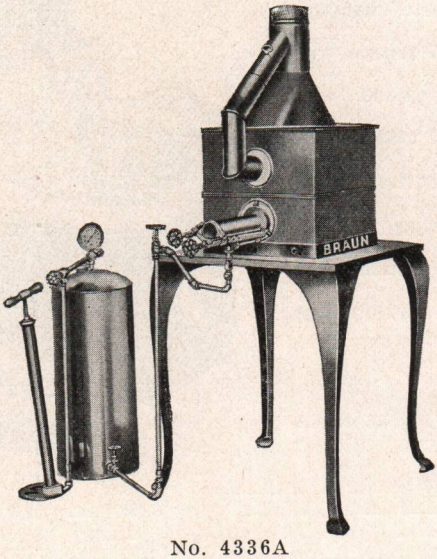
Type	301	311
Hood and Draft Elbow	$2.50	$2.50
Draft Boss	.25	.25
Covers, per set	1.00	1.00
Burner Hole Boss	.25	.25
Muffle Plug	.30	.35
Muffle	1.35	1.80
Iron Shelf	.25	.25

Prices net F. O. B. Denver, Salt Lake ,El Paso, or Los Angeles.
Agents for Braun Laboratory Appliances.

GASOLINE MUFFLE FURNACES

CARY TYPE

(Patented April 1, 1902, Oct. 6, 1903)



No. 4336A

REAR VIEW OF OUTFIT TYPES 331-361

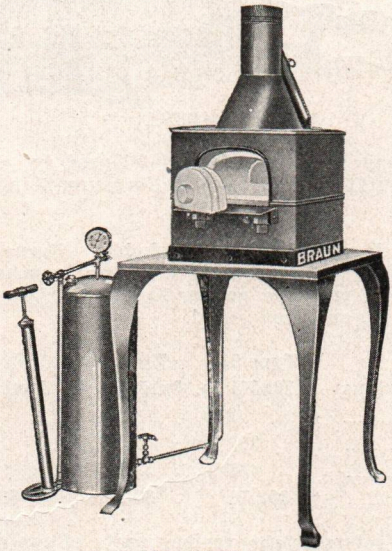
Showing the patent Draft Inducing Attachment of the Cary Muffle Furnace and the Cary Hydrocarbon Burner.

OUTFITS TYPES 331, 341, 351, 361

4336A These outfits are of the same general construction throughout and are built in four sizes, to meet the requirements of moderate or large amounts of work. The Furnaces, which are of the Cary type, fitted with Cary Hydrocarbon burners, are very efficient and economical.

All sizes have the patent draft inducing attachment connecting the muffle to the main flue. By means of it conditions in the muffle are under control at all times. The damper, which is placed in the connecting pipe, may be used to throttle the draft when the buttons in the cupels are opening. This insures satisfactory cupellation in all parts of the muffle.

GASOLINE MUFFLE FURNACES



No. 4337A

FRONT VIEW, SHOWING MUFFLE

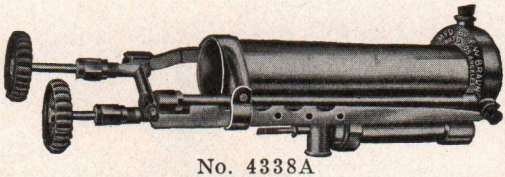
CARY TYPE

OUTFITS TYPES 331, 341, 351, 361

4337A The Cary Hydrocarbon Burner is scientifically constructed so that the fuel and air are mixed in proper proportions and heated to the right temperature for complete combustion. The burner fits tightly against the special boss in the burner opening of the furnace and thus all of the air entering the furnace passes through the mixing tube of the burner. The mixing tube is of such size and shape that the air is drawn into it by the jet of vaporized gasoline and thoroughly mixed with it. The flame is clean, emits no poisonous or noxious fumes, and is almost noiseless. The fuel consumption varies with the size of the burner and the air pressure used. The best results are obtained with from 35 to 40 pounds pressure in the fuel tank.

The difficulties encountered in generating other burners are overcome in this by the use of a separate valve and trough. Generation is accomplished by permitting a small quantity of gasoline to flow into this trough and igniting. the flame envelops the burner and quickly heats it to a temperature which allows opening the main needle valve and allowing the flame to be directed into the furnace.

GASOLINE MUFFLE FURNACES



No. 4338A

4338A The fire from the burner is distributed by the special combustion chambers around the muffle, producing a uniform temperature in all parts of the muffle.

4338B Each outfit is complete and includes: Furnace, one muffle, muffle door, hood with special draft attachment and two lengths of stovepipe, burner, gasoline tank with pump, pressure gauge, 12 feet of ¼-inch iron pipe, 2 swivel joints, valves and fittings, and iron stand.

Complete Outfit	Type 331	Type 341	Type 351	Type 361
Furnace Muffle dimensions	8x12x5¼ in.	9x15x5¾ in.	10x16x6¾ in.	14x18x7¼ in.
Cary Burner, size	2 in.	2¼ in.	2¼ in.	2¼ in.
Weight, net	300 lbs.	371 lbs.	515 lbs.	715 lbs.
Weight, packed	445 lbs.	518 lbs.	670 lbs.	895 lbs.
Price	$92.50	$99.00	$104.00	$124.00

The following data refers to the various parts of the complete outfits, which are supplied separately when desired.

	Weight Net	Weight Packed	Price
Furnace for Outfit Type 331	185 lbs.	250 lbs.	$30.00
Furnace for Outfit Type 341	255 lbs.	325 lbs.	35.00
Furnace for Outfit Type 351	400 lbs.	475 lbs.	40.00
Furnace for Outfit Type 361	600 lbs.	700 lbs.	60.00
Cary Burner, 2 in.	4¾ lbs.	7 lbs.	15.50
Cary Burner, 2¼ in.	5⅝ lbs.	7½ lbs.	17.00
Tank Outfit Type 1007	45 lbs.	70 lbs.	35.00
Iron Stand	65 lbs.	115 lbs.	12.00

RENEWAL PARTS

No. 4338C

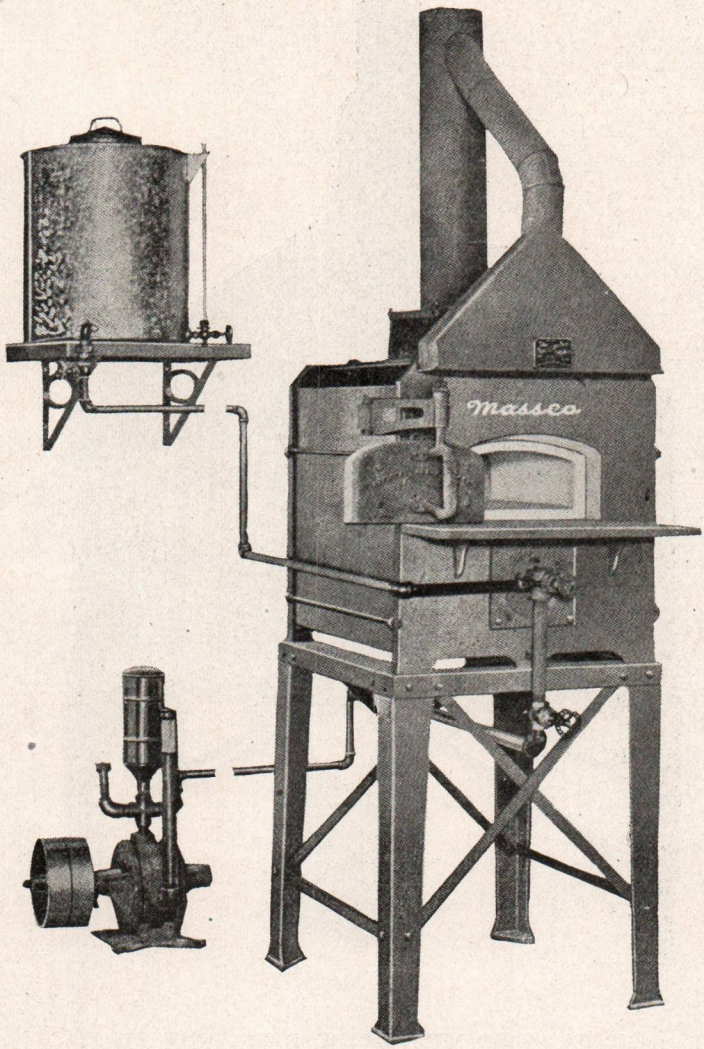
Type	331	341	351	361
Hood and draft elbow	$3.00	$3.50	$3.50	$3.50
Draft boss	.25	.25	.25	.25
Burner hole boss	.25	.25	.25	.25
Iron shelf	.25	.25	.25	.35
Muffle door	.35	.50	.50	.75
Muffle	2.10	2.70	3.15	4.95

Prices net, F. O. B. Denver, Salt Lake, El Paso or Los Angeles.

Agents for Braun Laboratory Appliances.

Massco

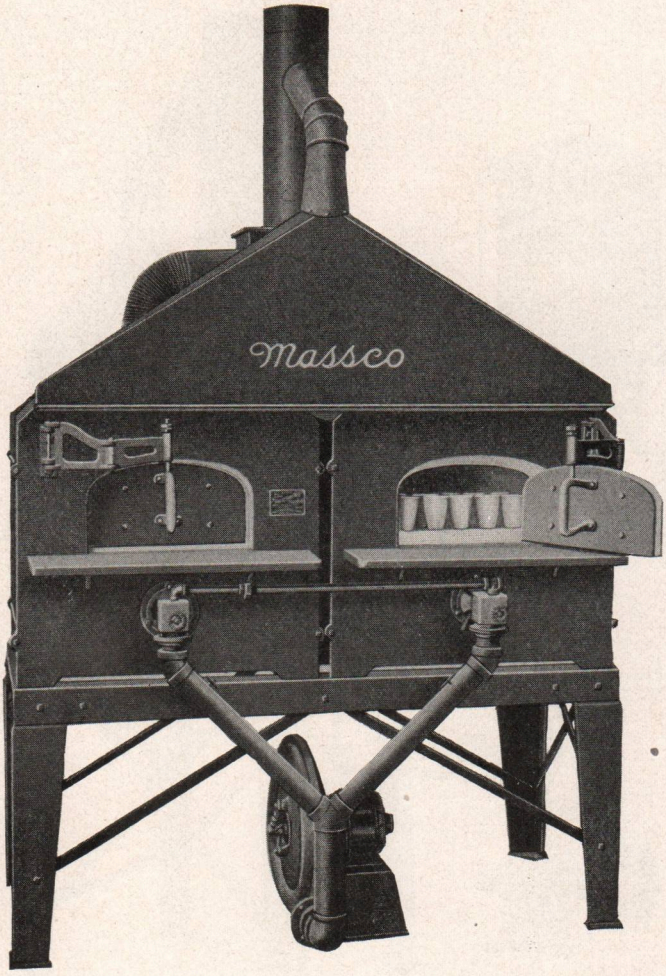
OIL FURNACE



No. 4339A

Massco MUFFLE TYPE ASSAY FURNACE

OIL-FIRED



4340A TWO MUFFLE DESIGN. UNIT TYPE.

Made in one, two or three muffle design.

Massco MUFFLE TYPE ASSAY FURNACE

No. 4341A

OIL-FIRED

Is Fully Equipped With

Massco Low Pressure Fuel Oil Burner.

Direct Driven Electric Motor Blower.

Oil Tank (20 gal. cap.) with Gauge and Oil Strainer.

Iron Stand, Hood, necessary Oil and Air Piping.

PRICES COMPLETE F. O. B. DENVER

Size of Muffle		NN 1019	LF 1220	LG 1420	S-173 1723
1 Muffle	Price	$275.00	$285.00	$295.00	$390.00
	Shipping Wt.	1,500 lbs.	1,600 lbs.	1,650 lbs.	3,000 lbs.
	Floor Space	30"x31"	30"x31"	30"x31"	40"x40"
2 Muffle	Price	$455.00	$470.00	$490.00	$640.00
	Shipping Wt.	2,700 lbs.	2,750 lbs.	2,800 lbs.	6,500 lbs.
	Floor Space	50"x31"	50"x31"	50"x31"	65"x40"
3 Muffle	Price	$580.00	$600.00	$630.00	$855.00
	Shipping Wt.	3,700 lbs.	4,000 lbs.	4,300 lbs.	9,500 lbs.
	Floor Space	75"x31"	78"x31"	84"x31"	96"x40"

SIZE OF MUFFLES

NN ..... 18¾ in. long, 10 in. wide, 6¼ in. high

QQ ..... 19 in. long, 12½ in. wide, 7¾ in. high

GU ..... 18 in. long, 14 in. wide, 6½ in. high

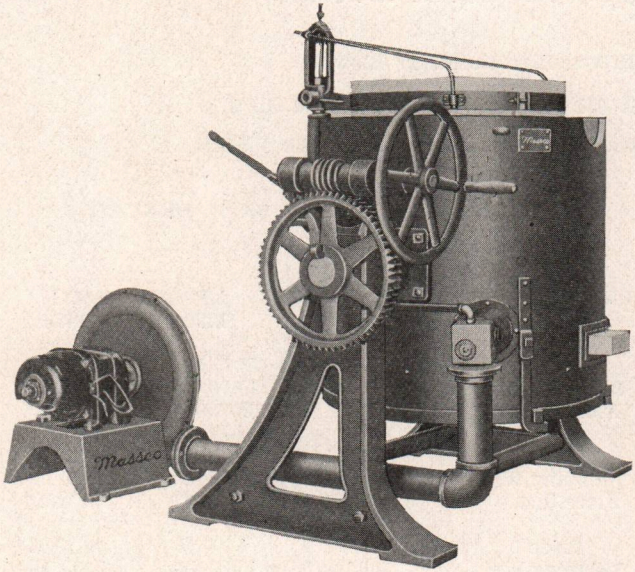
S-173 ..... 23 in. long, 17 in. wide, 9⅛ in. high

NOTICE

When ordering, be sure to give the Voltage, Phase and Cycle of your electric current.

Massco TILTING CRUCIBLE FURNACE

For Melting Brass, Copper, Aluminum, Nickel and Other Foundry Metals, Cyanide Precipitates, Gold and Silver Bullion.

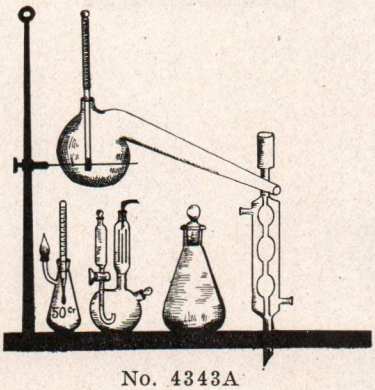


No. 4342A

Tilting Crucible Furnaces, including Crucible, Blower and Motor, Oil Tank and Low Pressure Fuel Oil Burner. But not Oil Tank Stand. F. O. B., Denver, Colo.

	Approximate Shipping Weights	Capacity Gals.	Capacity Qts.	Floor Space	Price
4342A Type 40 Crucible size	2,000 lbs.	2	....	36 in. x 36 in.	$400.00
4342B Type 60 Crucible size	2,300 lbs.	3	....	36 in. x 40 in.	500.00
4342C Type 125 Crucible size	2,500 lbs.	4	3	40 in. x 52 in.	600.00
4342D Type 150 Crucible size	2,700 lbs.	6	3	40 in. x 52 in.	625.00
4342E Type 275 Crucible size	2,950 lbs.	10	3	40 in. x 54 in.	700.00

GLASS WARE



No. 4343A

4343A We make a specialty of accurately graduated glassware and our Burettes, even those for ordinary commercial use, are always correct. To such desiring absolute accuracy we recommend the *Massco* Burettes with or without control stamp.

If you have any glassware protems, let up held solve this for you. We make special Laboratory and chemical glass apparatus and fine scientific instruments.

A few of our specialties we manufacture:

THERMOMETERS GLASS BLOWING GLASS GRINDING

SPECIAL APPARATUS CONSTRUCTED TO ANY DESIGN OR DRAWING

NEW AND IMPROVED APPARATUS GIVEN EXPERT ATTENTION.

REPAIRS CAREFULLY EXECUTED.

GAS ANALYSIS APPARATUS

DRYING APPARATUS

DISTILLING APPARATUS

NITROMETERS

EXTRACTION APPARATUS

OIL TESTING APPARATUS

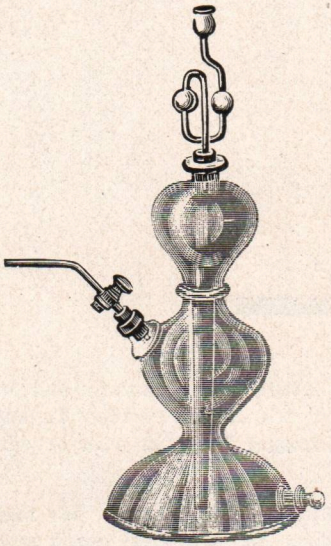
WATER ANALYSIS

GLASS STOP COCKS

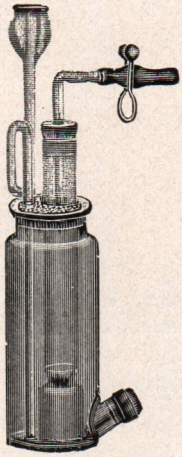
The manufacture of glass stopcocks is one of our specialties and particular attention is paid to their grinding. This department is equipped with all modern machinery for such work, and we are prepared to bid for quantity orders in this line as well as for special stopcocks and ground joints.

Let us hear from you and prove *Massco* service.

GAS APPARATUS



No. 4344A

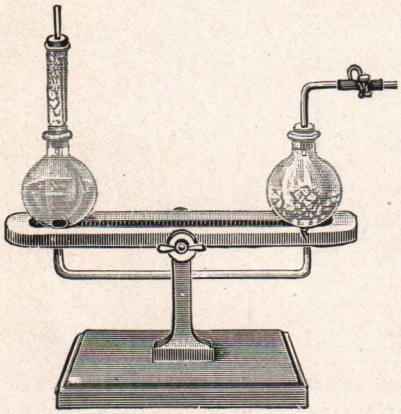


No. 4344B

4344A **SULPHURETTED HYDROGEN GENERATOR,** Kipp's Form.

Size	½ pt.	1 pt.	1 qt.	½ gal.	1 gal.
Each	$7.50	9.00	11.50	16.00	21.00

4344B **SULPHURETTED HYDROGEN GENERATOR,** Colorado Form.
Quart size, giving constant supply.....$3.50



No. 4344C

SULPHURETTED HYDROGEN, GENERATOR, BABO'S FORM.

4344C Very handy where a frequent supply of small quantities of H_2S is needed; complete, mounted on improved stand, with rubber stoppers, pinchcocks and delivery tube.

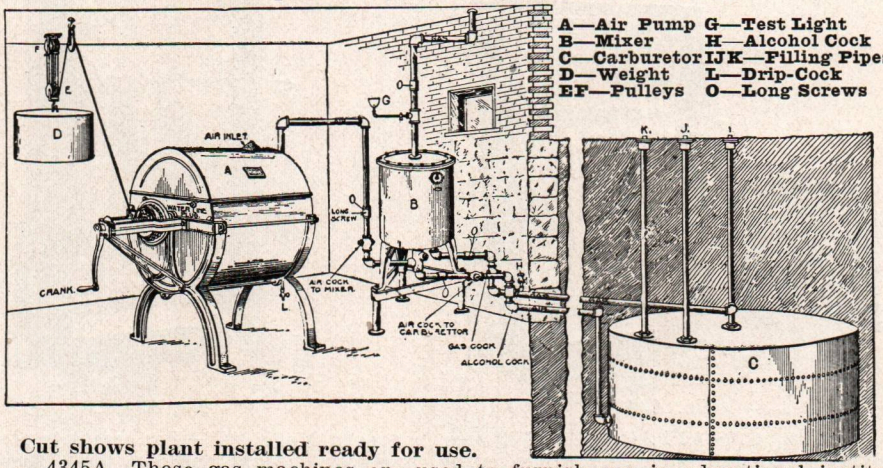
Prices on application.

GASES COMPRESSED IN CYLINDERS. Ammonia (anhydrous), carbonic acid liquidified, chloride gas liquefied, hydrogen gas compressed, oxygen gas compressed Prices on application.

THE MATTHEWS GAS MACHINE

The Standard for Forty Years

The Matthews Gas Machine, which automatically produces gas for domestic science departments, laboratories and illuminating



Cut shows plant installed ready for use.

4345A These gas machines are used to furnish gas in educational institutions where a supply of gas is not available. The only attention the machine requires is to fill in gasoline once or twice a year, and wind it up once a day or less often, depending on the amount of gas used. With this machine all burners, stoves, etc., are ready to light at all times as the machine maintains a constant supply of gas. The gas is made by passing air over gasoline and the quality of the gas is kept uniform by having the proportion of air and gasoline vapor constant.

No extra premium on your insurance, as the machine has been passed by the National Board of Underwriters.

Write to us for a list of colleges and high schools using this machine.

Illustrated catalog will be sent on request.

LIST OF SIZES AND PRICES

	Type of Burner	Capacity Carburetors, Gallons	Number of Cells	Shipping Weight, Machine Complete, Including Mixer	Price of Machine and Mixer Complete F. O. B. Chicago
4345A	30	156	2	1150 lbs.	$280.00
4345B	40	202½	2	1475 lbs.	335.00
4345C	50	252	3	1600 lbs.	375.00
4345D	75	315	3	2125 lbs.	430.00
4345E	100	375	4	2525 lbs.	525.00
4345F	150	437	4	2750 lbs.	635.00
4345G	200	512	4	3000 lbs.	750.00
4345H	300	770	4	3900 lbs.	975.00

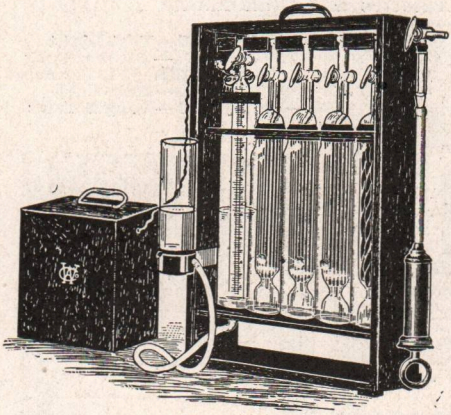
Prices on larger sizes quoted on application.

4345B A Complete Machine consists of Air Pump or Blower, Carburettor, one set of Pulleys, one Single Pulley, Wire Rope, Weight Holder, Hook for Weight Holder with flange attached, Gasoline Pump and Pipe, Wrench for Filler Caps and Packing Nut, Crank, one set Filler Pipes with Caps and Tee for gas attached for outlet on top of Carburetor, one Vent Pipe, one Filler Cap Cover, two Air Cocks, one Gas Cock, one Alcohol Inlet, Tee for Alcohol Inlet, four Long Screws, one Direction Card.

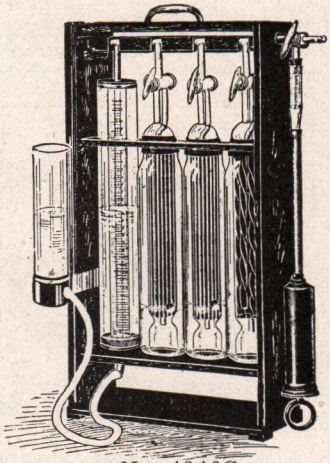
MIXING REGULATORS are complete with the following special fittings: One Test Burner, one Ell Burner Cock, one Tee and Nipple and three flanges.

The only material required for a complete installation of the machine which we do not furnish at the prices quoted above is about 75 ft. of 1-inch pipe or larger, depending on the size of the machine.

GAS ANALYSIS APPARATUS



No. 4346A



No. 4346C

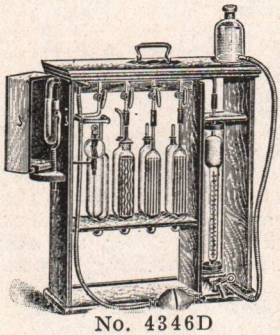
4346A **GAS APPARATUS,** Williams, Improved Model "A"—For complete analysis of combustible gases, illuminating, producer, natural and flue gas. Also especially adapted to chemical and corrosive gases, chlorine, hydrochloric acid, sudphur dioxide and smelter gas. Takes dry samples directly into the apparatus. Fitted with bubbling pipettes, mantle type, filled with glass tubes, producing rapid absorption. Very compact and portable, accurate, rapid and easily operated. Mounted in attractive wood case. Full directions with each outfit. Complete with portable explosion coil

Price each $80.00

4346B **PORTABLE EXPLOSION COIL.** Extra 15.00

4346C **GAS APPARATUS,** Williams' Improved, Model "B"—For flue-gas analgsis; burner gases in acid plants, sulphite mills and smelters, and other places where quick and accurate analyses are to be made by chemists, engineers or firemen. Has the same general features of compactness, portability, accuracy and rapidiity as the Model "A". Complete in wood case. Full directions with each outfit.

Price each $50.00

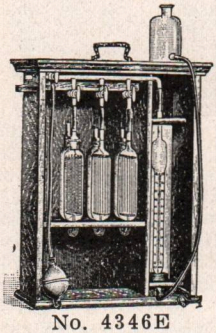


No. 4346D

4346E **GAS APPARATUS.** According to Orsat-Muencke. For CO_2, CO and O, with three absorption cylinders, one with copper spirals, with 5-way tube and 4 taps, one of which (the outlet) a 3-way cock. Complete in wooden case.

Price each $40.00

4346D **GAS APPARATUS.** According to Orsat-Lunge. For analysis of CO_2, CO, O and H, consisting of four absorption cylinders, one with copper spirals, spirit lamp on a movable metal holder, palladium-asbestos capillary tube, leveling bottle, etc. Complete in wooden case.

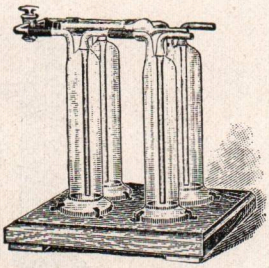


No. 4346E

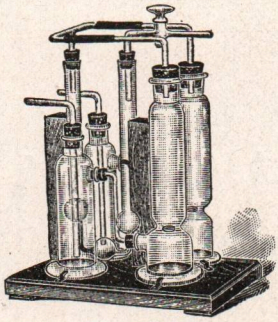
Price, each $50.00

Renewal parts for above, prices on application.

GAS APPARATUS



No. 4347A

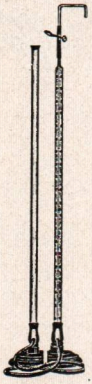


No. 4347B

4347A **GAS DRYING APPARATUS, BENNERT'S.** Consisting of four cylinders, with sealed-in tubes, mounted in brass cups on wooden board $25.00

4347B **GAS DRYING APPARATUS, GLASER'S.** For drying and washing of gases 20.00

GAS BURETTES



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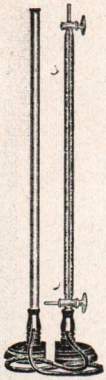
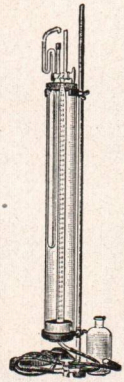


No. 4347D



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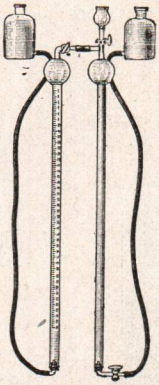
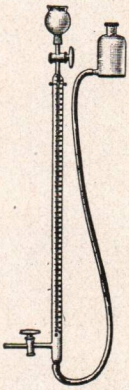


No. 4347F



No. 4347G

4347C **GAS BURETTES, HEMPEL'S.** With heavy bases. Complete, per pair ..... $ 7.00

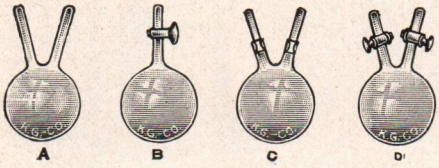
4347D **GAS BURETTES, HEMPEL'S.** With glass stopcocks and heavy bases. Per pair 12.00

4347E **GAS BURETTES, HEMPEL'S.** Arranged for temperature and barometic correction, complete as shown in engraving 25.00
Glass parts, only 22.00

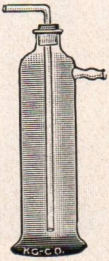
4347F **GAS BURETTES, ELLIOT'S.** Especially adapted to analysis of furnace and illuminating gases. Complete with reservoir and rubber connections, as shown in illustration 25.00
The two burette parts, only 23.00

4347G **GAS BURETTES.** The explosion burette, extra, each 12.00

GAS APPARATUS



4348A



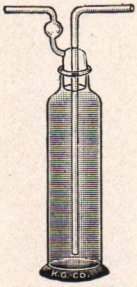
4349B

4348A **GAS BALLOONS.** Of blown glass for weighing gases. Type 7850.

Style	A	B	C	D
Each	$1.50	2.25	2.25	3.75

4349B **GAS WASHING BOTTLES, BUNSEN'S.** with rubber stopper. Type 7855.

Capacity, cc.	125	250	500
Each	$0.60	.75	.90



4349C

4349D

4348C **GAS WASHING BOTTLES, DRECHSEL'S.** High form. Type 7860.

Capacity, cc.	100	150	250	500
Each	$1.10	1.30	1.65	2.00

4348D **GAS BURETTES, HEMPEL'S.** Set consisting of one plain tube graduated to 100 cc. in ⅕ cc. Type 7865.....Per set 4.00

4348E **GAS BURETTES, HEMPEL'S.** Set consists of one plain tube and one tube graduated to 100 cc. in ⅕ 33; fitted with glass stopcock. Type 7870. .....Per set 5.50

GAS APPARATUS

No. 4349A No. 4349C No. 4349D

4349A **GAS BURETTES, BUNTE'S.** Without water jacket; graduated to 50 cc. in1/10 cc. with two stopcocks. Type 7875. Each.....$7.50

4349B **GAS BURETTES, BUNTE'S.** Same as Type 7875, with water packet. Type 7880. Each..... 8.60

4349C **GAS COLLECTING TUBES.** Long form. Capacity, 125 cc., with two stopcocks. Type 7885. Each..... 3.75

4349D **GAS COLLECTING TUBES.** Short form. Capacity, 125 cc., with two stopcocks. Type 7890. Each..... 3.75

No. 4349E No. 4349F No. 4349G

4349E **GAS COLLECTING TUBES.** With bulb in center and two glass stopcocks. Type 7895. Each..... 3.75

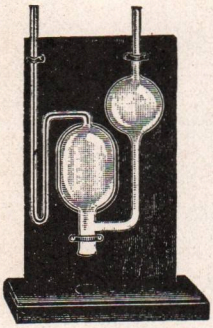
4349F **GAS MEASURING TUBES, BUNSEN'S.** Type 7900.

Capacity, cc.	25	50	100	200
Graduated in	1/5	1/5	1/2	1
Each	$1.20	1.60	1.80	2.40

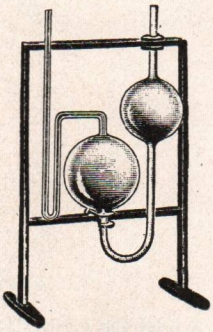
4349G **GAS MEASURING TUBES, BUNSEN'S.** with glass stopcocks. Type 7905.

Capacity, cc.	25	50	100	200
Graduated in	1/5	1/5	1/2	1
Each	$2.80	3.20	3.40	4.00

GAS APPARATUS



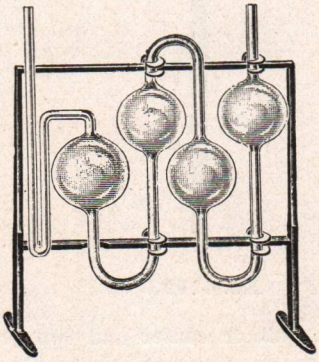
No. 4350A
For Solids



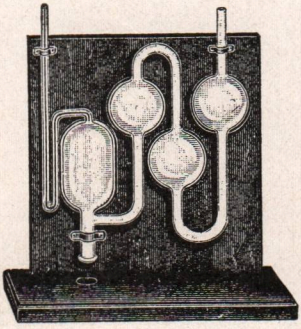
No. 4350B
For Liquids

4350A **GAS PIPETTES, HEMPEL'S.** Absorption, simple, for solids, mounted $5.00
Glass part, only 4.50

4350B **GAS PIPETTES, HEMPEL'S.** Absorption, simple, for liquids, mounted 4.50
Glass part, only 3.25



No. 4350C
For Liquids

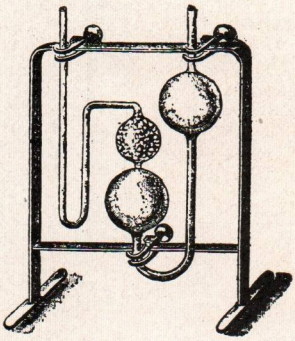


No. 4350D
For Solids

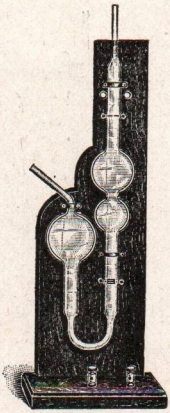
4350C **GAS PIPETTES, HEMPEL'S.** Absorption, compound, for liquids, mounted $5.50
Glass part, only 4.50

4350D **GAS PIPETTES, Hempel's.** Absorption, compound, for solids, mounted 7.00
Glass part, only 5.75

GAS APPARATUS



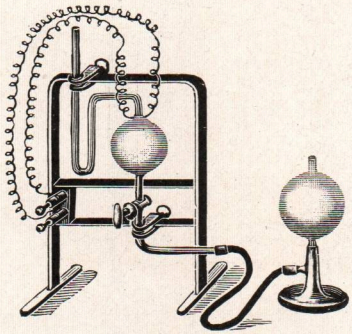
No. 4351A



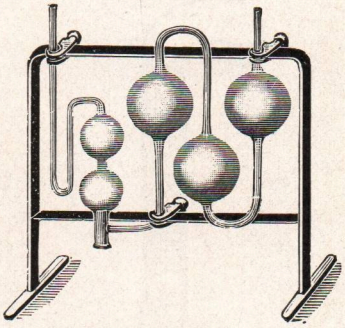
No. 4351B

4351A **GAS PIPETTES, HEMPEL'S.** Ethylene, bulb filled with glass beads. Price, mounted $6.00
Price, glass part, only 5.25

4351B **GAS PIPETTES, HEMPEL'S.** Explosion, new form ,with electrodes for generation of Hand O, mounted on wooden support 9.00
Price, glass part, only 7.50



No. 4351C

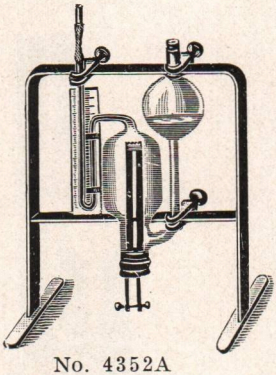


No. 4351D

4351C **GAS PIPETTES, HEMPEL'S.** Explosion, with leveling bulb $10.25
Price, glass part, only 7.50

4351D **GAS PIPETTES, HEMPEL'S.** Hydrogen, mounted 7.50
Price, glass part, only 6.50

GAS APPARATUS



No. 4352A

No. 4352B

No. 4352C

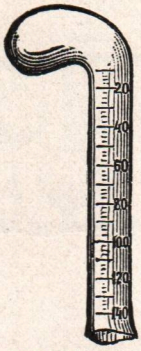
4352A **GAS PIPETTES, HEMPEL'S.** For estimation of Methane, with platinum spiral. Price each $8.25

Price, glass part, only 7.25

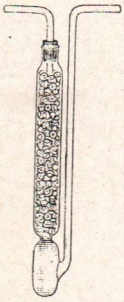
4352B **HEMPEL'S PALLADIUM TUBE,** for absorption; filled with palladium black 6.75

4352C **GAS ABSORPTION TUBE, BUNSEN'S.** Straight, graduated 2.50

GAS ABSORPTION TUBES



No. 4352D



No. 4352E

No. 4352F

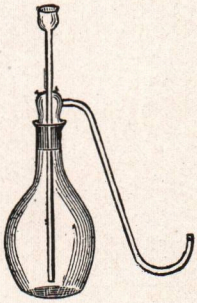
4352D **GAS ABSORPTION TUBE, BUNSEN'S.** With bulb, graduated $3.00

4352E **GAS ABSORPTION TUBE, BABO'S.** Filled with glass beads 2.50

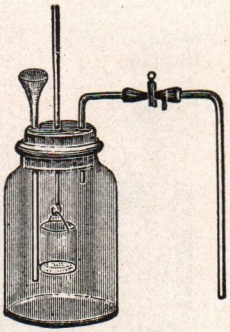
4352F **GAS ABSORPTION TUBE, EMMERLING'S.** Filled with glass beads 3.25

GAS GENERATORS

No. 4353A



No. 4353B



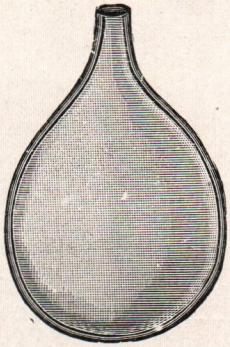
No. 4353C

4353A **GAS GENERATOR.** Consisting of flask, funnel tube and delivery tube. Pint size.....each $0.75

4353B **GAS GENERATOR.** As above, with tubes ground into the neck Pint size .....each 2.00

4353C **GAS GENERATOR.** Consisting of generating bottle, funnel tube, lead basket and delivery tube with pinch-cock. Quart size .....each 4.50

GAS BAGS AND HOLDERS



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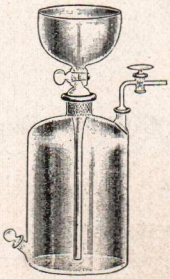


No. 4353F

No. 4353G

4353D **GAS BAGS.** Of best rubber, oval.

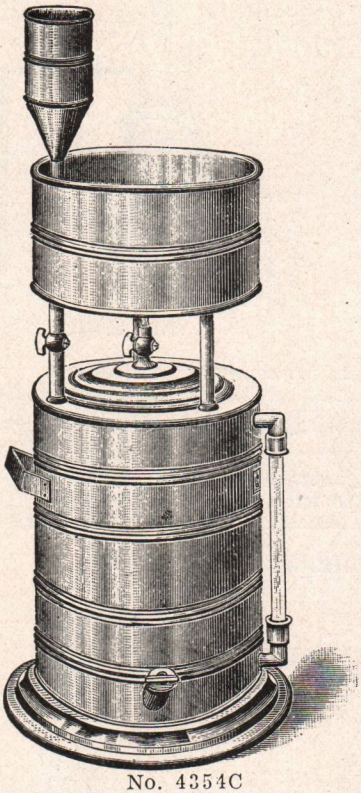
Capacity .....gals.	1	2	3	5
Each	$3.25	3.75	4.25	5.50

4353E **BRASS NOZZLE AND STOPCOCK.** For any bag.....each $2.25

4353F **GAS HOLDER, BERZELIU'S.** Entirely of glass, capacity 1 gallon. Price on application.

4353G **GAS HOLDER, MITSCHERLICH'S.** Of glass with brass fittings, capacity 3 gallons. Price on application.

GAS HOLDERS AND REGULATORS



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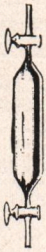

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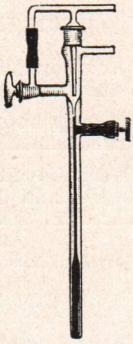

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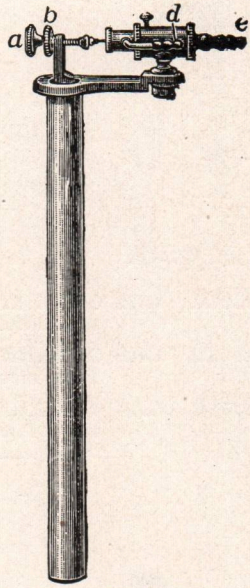


No. 4354F

4354A **GAS COLLECTING TUBES.** With stopcock at each end. Capacity, about 250 cc., each ..... $ 6.00

4354B **GAS DISTRIBUTORS.** With four stopcocks and center light 8.00

4354C **GAS HOLDER, PEPY'S.** Of heavy zinc, improved form, capacity 10 gals. 35.00

4354D **GAS REGULATOR, REICHERT'S** 3.25

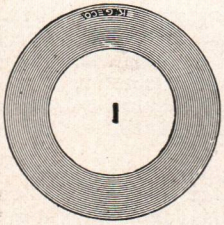
4354E **GAS REGULATOR, REICHERT'S.** With stopcock 5.00

4354F **GAS REGULATOR.** According to Roux, without the use of mercury or glass in its construction. Made in two sizes. Type 1125.
Small size, 10 inches 10.00
Large size, 12 inches 12.50

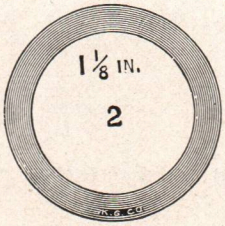
4354G **GAS REGULATOR, GREENMAN'S.** Made entirely of steel (a special feature). Each 25.00

GLASS TUBING AND ROD

No. 4355A



No. 4355B



No. 4355C

4355A **GLASS TUBING.** Regular weight, No. 3 wall. Type 7910.

1½ m/m.—	2½ m/m.	Per pound		$1.20
2½ m/m.—	3½ m/m.	Per pound		1.00
3 m/m.—	4 m/m.	Per pound		.80
5 m/m.—	6 m/m.	Per pound		.50
7 m/m.—	8 m/m.	Per pound		.40
	9 m/m.	Per pound		.36
10 m/m.—	11 m/m.	Per pound		.32
12 m/m.—	14 m/m.	Per pound		.28
15 m/m.—	21 m/m.	Per pound		.26
22 m/m.—	25 m/m.	Per pound		.28
26 m/m.—	30 m/m.	Per pound		.32
30 m/m.—	38 m/m.	Per pound		.40
38 m/m.—	51 m/m.	Per pound		.60

4355B No. 1 Weight Tubing, 16c per pound added to our regular price. Type 7915.

4355C No. 2 Weight Tubing, heavy, 8c per pound extra, added to our regular price. Type 7920.

No. 4355D

No. 4355E

No. 4355F

Lead Glass. Per pound, extra	.12
Amber Glass. Per pound, extra	.12
Blue Glass. Per pound, extra	.20

4355D **GLASS TUBING, BAROMETER.** Sizes from ¼ inch to ⅜ inch. Type 7925. Per pound $0.80

4355E **GLASS TUBING, CAPILLARY.** ½ m/m. to 1 m/m. bore; about 6 m/m. outside diameter. Type 2930. Per pound .80

4355F **GLASS ROD.** Flint glass. Type 7935.

2 m/m. to 3 m/m. diameter,	Per pound	00.80
3 m/m. diameter.	Per pound	.60
4 m/m. to 5 m/m. diameter.	Per pound	.48
6 m/m. to 7 m/m. diameter.	Per pound	.40
8 m/m. to 13 m/m. diameter.	Per pound	.36

GLASS TUBING

4356A **GLASS ROD.** Amber glass. Type 7940.

2 m/m. to 3 m/m. diameter.	Per pound	$0.92
3 m/m. diameter.	Per pound	.72
4 m/m. to 5 m/m. diameter.	Per pound	.60
6 m/m. to 7 m/m. diameter.	Per pound	.52
8 m/m. to 13 m/m. diameter.	Per pound	.48

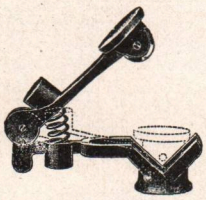
4356B **GLASS ROD.** Blue glass. Type 7945.

2 m/m. to 3 m/m. diameter.	Per pound	$1.00
3 m/m. diameter.	Per pound	.80
4 m/m. to 5 m/m. diameter.	Per pound	.68
6 m/m. to 7 m/m. diameter.	Per pound	.60
8 m/m. to 13 m/m. diameter.	Per pound	.56

4356C **STIRRING ROD.** Both ends rounded. Type 7950.

Length, inches	4	5	6	8	10	12	15
Diameter, inches	1/8	1/8	3/16	3/16	1/4	5/16	3/8
Dozen	$0.30	.40	.45	.60	.90	1.50	1.75

GLASS BEADS, CUTTERS, ETC.



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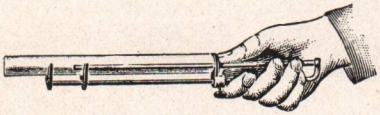


No. 4356G

No. 4356H

4356E **GLASS BEADS.** Solid, for surface—extending medium in absorption. Price per pound on application.

4356F **GLASS CUTTER.** For tubing, Griffin's, nickel-plated brass $1.25
Extra steel wheels ..... .25

4356G **GLASS CUTTER.** For tubing, will cut any length up to 10 in. 1.75

4356H **GLASS CUTTER.** Steel wheel, for plates ..... .25

4356I **GLASS PLATES.** Square, heavy, plate-glass, ground on one side. Size, 3, 4, 5, 6, 8, 10, 12, 15 and 20 square inches. Prices on application.

4356J **GLASS PLATES.** Square, light, ground on one side. Size, 2, 3, 4, 5, 6, 8, 10 and 12 square inches. Prices on application.

4356K **GLASS PLATES.** Square, blue colored glass. Size, 2x2, 3x3, 4x4, 5x5 and 6x6 inches. Prices on application.

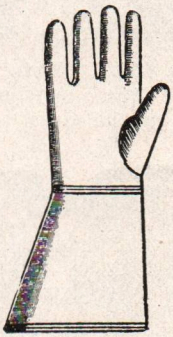
4356L **GLASS WOOL.** See chemical list.

GLOVES

RUBBER

No. 4357A

No. 4357B


No. 4357C

4357A **GLOVES, RUBBER.** Half long, black. Type 28.

Size 13 ..... per pair $2.50
Size 14 ..... per pair 2.50
Size 15 ..... per pair 2.50

4357B **GLOVES, RUBBER.** Half long, black. Type 32. With 4½-inch gauntlet, net lined.

Size 13 ..... per pair $3.00
Size 14 ..... per pair 3.00
Size 15 ..... per pair 3.00

4357C **GLOVES, RUBBER, GAUNTLET.** White. Type 39.

Size 9-inch Gauntlet ..... per pair $4.50
Size 14-inch Gauntlet ..... per pair 5.00
Size 21-inch Gauntlet ..... per pair 6.00

4357D **SEAMLESS LINEMEN'S GLOVES.** Maroon, 10,000 volt, heavy weight. Type 701.

Size 11. Length 12 inches ..... per pair $3.00

4357E **MITTENS, WITH GAUNTLET.** Type 66.

Size 5 inches ..... per pair $2.50

GOGGLES, SAFETY

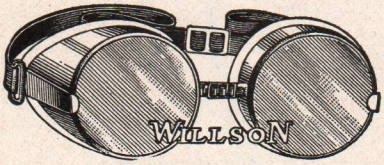
STYLE L1. Outside Long Distance of Eyecup, 2¾ Inch.

No. 4358B. Style L2.

4358A Willson Welding Goggle. A new non-metallic safety goggle affording the highest degree of protection from penetrating light, heat and electricity. Being well ventilated and light in weight, the goggle can be worn continuously with comfort. By means of a simple device, the glass can be removed without the use of tools. Furnished with Willson Industro Glass.
Price .....per pair $3.00

4358B Same as Style L1, but furnished with thick ground and polished chippers' special glass. Price.....per pair $2.00

STYLE L61. Rim Long Diameter, 2½ In.



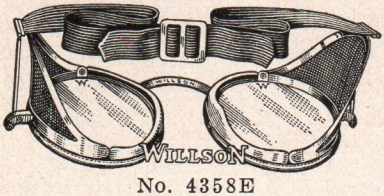
No. 4358D

4358C Willson Rubber Goggles. Recommended for protecting against gases, liquids, etc. Its features include a rubber mask, oval clear glass and adjustable headband.
Price .....per pair $1.00

4358D Style L60. Same as Style L61, but finished with amber glass.
Price .....per pair $1.00

Styles L60 and L61 can be furnished with or without ventilating holes as specified.

STYLE S11



No. 4358E

4358E Willson Safety-Flange Goggle with the Willson Adjustable Bridge and deep nose-rests. This goggle is offered as the most effective type of eye-protector for resisting hardest blows. Note the deep nose-rests for distributing contact with the face and minimizing shock. Other features include reinforced wire screen side guards, detachable elastic headbands, and ground and polished chippers, thick glass.
Price .....per pair $1.75

STYLE E2. Rim Diameter, 1⅞ Inches.

No. 4358F

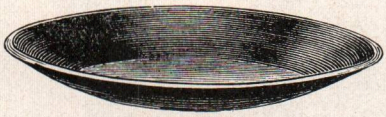
4358F All parts touching the face are bound with velvet. Its construction includes the Willson Adjustable Bridge, wire screen sideguards, detachable elastice headbands, and ground and polished clear flat glass; or amber, fieuzal, or light-smoke, curved glass if desired.
Price .....per pair $1.75

STYLE F3. Rim Diameter, 1⅞ Inches.

No. 4358G

4358G Willson Safety-Flange Goggle with improved bridge-and-bar rigid construction. Used by those who do not wish an adjustable goggle for extra-hazardous work. Its features include a broad saddle bridge in three sizes, reinforced wire screen side-guards, thick ground and polished chippers' glass, and flexible cable earbows. Specify broad (A), medium (B), or narrow (C) bridge. Price .....per pair $1.50

GOLD WASHING PANS



No. 4359A

No. 4359D

4359A **MINERS' GOLD WASHING PANS, ALUMINUM.**

Diameter	inches 6	12	16
Depth	inches 1¾	2	2½
Each	$1.00	1.25	2.00

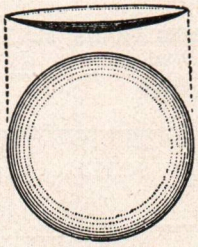
4359B **MINERS' GOLD WASHING PANS, COPPER.**

Diameter	inches	12	16
Depth	inches	2	2½
Each		$3.00	4.00

4359C **MINERS' GOLD WASHING PANS, POLISHED STEEL.**

Diameter	inches 6	12	16
Depth	inches 1¾	2	2½
Each	$0.40	.50	.75

4359D **MINERS' GOLD WASHING PANS, STEEL.** With copper bottom, 16 inches diameter, 2½ inches deep.....$4.00



No. 4359E

4359E **GOLD PANS, RICHARD'S.** Vanning plaque, of enameled iron....$1.00

No. 4359F

4359F **GOLD WASHING HORNS, MINERS'.** Of plain horn, unpolished, best quality. Each.....$1.50

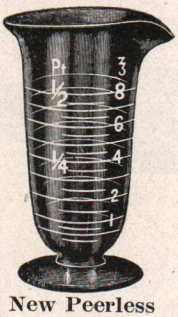
4359G **GOLD WASHING HORNS.** Of black polished buffalo horn..... 2.25

4359H **GOLD WASHING HORNS.** Of hard rubber, black..... 1.25

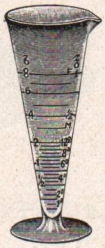
4359I **GOLD WASHING HORNS.** Of copper..... 1.25

4359J **GOLD WASHING HORNS.** Of steel, polished..... .50

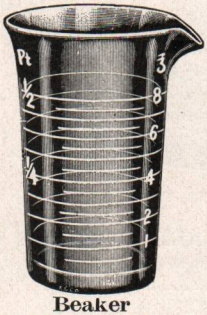
GRADUATES



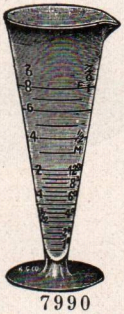
New Peerless
No. 4360A



Cone
No. 4360B



Beaker
No. 4360C



7990
No. 4360D

NOTE: In our Graduating work the Liter of the International Bureau of Weights and Measures is taken as the unit of volume, in accordance with the requirements of the Pharmacopoeia.

With the aid of an apparatus specially devised and controlled by ourselves we are able to insure absolute freedom from error. In no case is mechanical division employed, but every line on each graduate is determined independently and with the same accuracy.

The principle lines on our single scale graduates extend entirely around the glass so that a level can be obtained without difficulty.

Our graduates are made to deliver the quantities indicated and are a standard at 15 degrees C. (59 degrees F.).

THE FOLLOWING PRICES APPLY TO EITHER THE NEW PEERLESS, CONE OR BEAKER SHAPE GRADUATES. EACH GRADUATE IS PACKED IN AN INDIVIDUAL CONTAINER AND IS GUARANTEED ACCURATE.

4360A **GRADUATES, APOTHECARIES MEASURE.** Graduated in ounces.

Capacity	60 minim		120 minim		½ oz.	1	2
Each	$0.37		.45		.27	.30	.33
Capacity oz.	3	4	6	8	12	16	32
Each	$0.37	.40	.44	.48	.64	.80	1.38

4360B **GRADUATES, METRIC SCALE.** Graduated in cubic centimetres. Type 7980.

Capacity, cc.	5	10	15	30	60	100
Each	$0.37	.45	.32	.34	.38	.42
Capacity, cc.	125	200	250	375	500	1000
Each	$0.45	.53	.60	.78	.94	1.68

4360C **GRADUATES, DOUBLE SCALE.** Graduated in ounces and cubic centimeters. Type 7985.

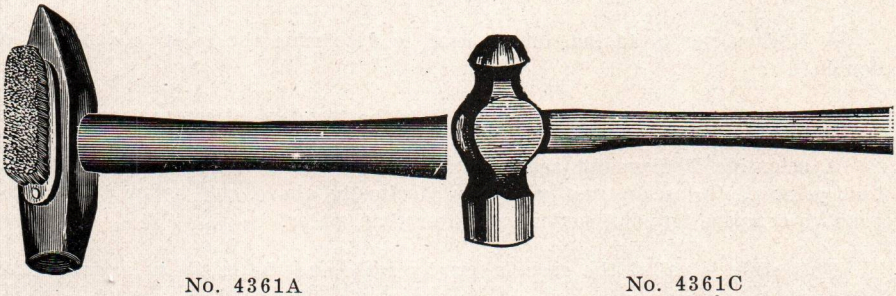
Capacity	60 minim		120 minim		½ oz.	1	2
Capacity, cc.	5		10		15	30	60
Each	$0.46		.54		.39	.43	.47
Capacity oz.	3	4	6	8	12	16	32
Capacity, cc	100	125	200	250	375	500	1000
Each	$0.53	.61	.73	.86	1.08	1.30	2.20

4360D **GRADUATES.** Graduated in minims up to 120 minim and in drams up to one ounce. Single scale. Type 7990. Each....$0.54

4360F **GRADUATES.** Same as Type 7990; double scale. Type 7995.
Each ..... .67

For Cylinders see Cylinders.
For Grinders see Crushers.

HAMMERS



No. 4361A No. 4361C

4361A **HAMMERS, Donaldson's.** Same as slagging hammer, for cleaning slag anvil, with brush 2¼x½ inch, attached to one side by screws.

Weight ..... oz.	16	19	34
Each	$1.50	1.75	2.00

4361B **HAMMERS.** Extra brushes for above $0.75

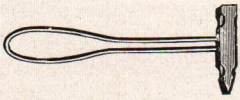
4361C **HAMMERS. Ball Pein.** Best cast steel.

Weight	12	16
Each	$1.00	1.25

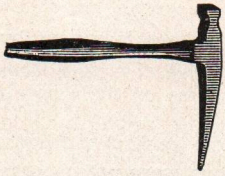
No. 4361D

4361D **HAMMERS, SLAGGING.** Of superior cast steel.

Weight ..... oz.	7	12	15	18	22
Each	$0.75	1.00	1.00	1.25	1.50



No. 4361E



No. 4361G

4361E **HAMMERS, BLOW PIPE, Plattner's.**
Nickel-plated, with wire handle ..... each $1.00

4361F **HAMMERS, STRIKING.** For breaking up large samples, double-pole.
Each 1.50

4361G **HAMMERS, PROSPECTING PICKS.**

Pick length	7	8
Each	$1.75	2.00

HOSE CONNECTIONS. See Rubber Hose Connections.

HYDROMETERS IN GENERAL

A Hydrometer is an instrument used to determine the relative densities of liquids.

Pure water at a temperature of 60° F. is the standard of comparison.

A scientific Hydrometer scale uses this standard of comparison for the initial point of the scale, and graduates decimally above and below this initial point to compare liquids heavier or lighter than water.

This scale is called the specific gravity scale and the initial point is marked 1.000.

For example, a liquid whose density is 50 per cent greater than water would read 1.500 upon such a scale, and one whose density is 25 per cent lighter than water would read .750.

To place upon one Hydrometer, a scale covering these maximum ranges would make the insrument (if of reasonable size) too sluggish for practical use; hence these limits are covered upon a series of Hydrometer stems, placing more degrees upon the less delicate and less degrees upon the more refined ones.

Comparatively few Hydrometers are scaled with the specific gravity scale.

Most of them have arbitrary scales, note Beaumé, Brix, Balling and a hundred minor ones.

It is fair to assume that the multiplicity of Hydrometer scales has arisen because original investigators found that it suited their convenience to divide the stems of their Hydrometers in other than the specific gravity divisions, and their influence (note Brix and Balling upon sugar) has been strong enough to continue the use of their arbitrary scales.

The chaos is caused by the fact that the originators of these arbitrary scales left no clear and definite statement of the methods whereby they arrived at their scale values or their specific gravity equivalents.

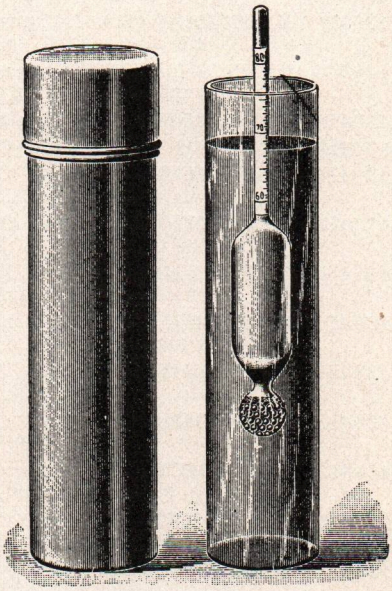
Their general methods are known, but the niceties that constitute standard conditions were not observed (no doubt they could not be at that time) and to-day each civilized country possessing a Bureau of Standards gives its own value in specific gravity degrees to the arbitrary standard Hydrometer scales. (This is particularly noticeable in the Beaumé).

If of one of the less known scales, we find that custom has fixed upon one value to a greater extent than upon another, we accordingly supply the scale as the majority of interests have determined, but we do so knowing that there are in use other arbitrary scales bearing the same name but of different specific gravity value.

HYDROMETERS

No. 4363A
Acid and Heavy Liquids

No. 4363B
Round Battery Hydrometer



No. 4363H
Hydrometer with Test Jar in Nickel Case

4363A **HYDROMETERS.** Acid and heavy liquids, Beaumé ,0 to 70 in 1-1°. Ordinary grade $0.75

4363B **HYDROMETERS.** Acid and heavy liquids, Beaumé, 0 to 70 in 1-1°. Medium grade 1.00

4363C **HYDROMETERS.** Acid, Beaumé, 0 to 30 in ½° 1.25

4363D **HYDROMETERS.** Acid, Beaumé, 30 to 60 in ½° 1.25

4363E **HYDROMETERS.** Acid, Beaumé, 60 to 70 in 1-10°. Standard grade 2.25

4363F **HYDROMETERS.** Alcohol, Proof and Tralle Scale 1.00

4363G **HYDROMETERS.** Alcohol, Proof and Tralle Scale, with thermometer, U. S. Custom House scale 100 below proof and 100 above proof 2.50

4363H **HYDROMETERS.** Alkali and heavy liquids, Beaumé Scale, 0 to 50 in 1-1° ..... .75

4363I **HYDROMETERS.** Ammonia and light liquids, Beumé Scale, 10 to 50 in 1-1° ..... .75

We are prepared to supply you a hydrometer for every purpose; specify for what you require them, and we will have it made if not in stock.

HYDROMETERS

4364A **HYDROMETERS.** Battery, Beaumé Scale, Round, 5 inches long, 10 to 40 in 1° $0.75

4364B **HYDROMETERS.** Battery, Flat Bulb, Short for Storage Batteries, Scale Range,1150 to 1300 ..... 1.00

4364C **HYDROMETERS.** Battery, with Points, Beamé and Specific Gravity, Range 1100 to 1300 ..... 1.25

4364D **HYDROMETERS.** Cider Beaumé Scale, 0 to 8 in 1° graduations .75

4364E **HYDROMETERS.** Coal Oil, Beaumé Scale, 10 to 90 in 1-1° ..... .75

4364F **HYDROMETERS.** Coal Oil, with Thermometer, Beaumé Scale, 10 to 90 in 1-1° 1.75

4364G **HYDROMETERS.** Coal Oil, Standard, 10 to 21, 19 to 31, 29 to 41, 39 to 51, 49 to 61, 59 to 71, 69 to 81, 79 to 91, Divided 1-10° 3.75

4364H **HYDROMETERS.** Gasoline, Beaumé Scale, with Thermometer, Nickel Case, 6 inches long, 40 to 90 in 1° 2.00

4364I **HYDROMETERS.** Light Liquids, Beaumé Scale, 10 to 100 in 1° Graduations ..... .75,

4364J **HYDROMETERS.** Light Liquids, Beaumé and Specific Gravity Scale, 0.700 to 1.000 ..... 1.25

4364K **HYDROMETERS.** Light Liquids, Beaumé and Specific Gravity Scale, 0.700 to 0.800, 0.800 to 0.900, 0.900 to 1.000 ..... 2.00

4364L **HYDROMETERS.** Light and Heavy Liquids, Universal, 15 inches long 0.7000 to 2.000 ..... 2.50

4364M **HYDROMETERS.** Heavy Liquids, Beaumé Scale, 0 to 70 in 1° Graduations 1.00

4364N **HYDROMETERS.** Heavy Liquids, Beaumé and Specific Gravity Scale, 1.000 to 1.900 ..... 1.25

4364O **HYDROMETERS.** Heavy Liquids, Beaumé and Specific Gravity Scale, 1.000 to 1.900 with Thermometer 4.50

4364P **HYDROMETERS.** Heavy Liquids, Beaumé and Specific Gravity Scale, 1.000 to 1.200, 1.200 to 1.400, 1.400 to 1.600, 1.600 to 1.800, 1.800 to 2.000 ..... 1.50

4364Q **HYDROMETERS.** Lime and Sulphur or (Sprayometer), New York Scale, 0 to 10° Beaumé and 1.000 to 1.100 Specific Gravity, 1-10° Beaumé, 1° Specific Gravity Divisions 1.00

4364R **HYDROMETERS.** Lime and Sulphur or (Sprayometer), New York Scale, 25-35° Beaumé 1.210 to 1.320, Specific Gravity, 1-10° Beaumé, and 1° Specific Gravity Divisons 1.00

4364S **HYDROMETERS.** Lye, Beaumé Scale, 0 to 50 in 1° Graduations .75

4364T **HYDROMETERS.** Milk, New York Board of Health Pattern, Scale, 0 to 120° in 2° Graduations ..... .75

4364U **HYDROMETERS.** Milk, New York Board of Health, with Thermometer, Scale, 0 to 120° in 2° Graduations ..... .25

4364V **HYDROMETERS.** Quevennes, 1.015 to 1.040 Specific Gravity Scale ..... .75

4364W **HYDROMETERS.** Quevennes, 1.015 to 1.040 Specific Gravity Scale, 13 inches long, with Thermometer 2.50

4364X **HYDROMETERS.** Salt or Pickle, per cent Scale, 0 to 100° in 1° Graduations 1.00

4364Y **HYDROMETERS.** Silver Solution or Actinometers, Special Scale, 0 to 80° in 1° Graduations, 5 inches long, with Test Jar 1.00

4364Z **HYDROMETERS.** Spirits. See Alcohol.

HYDROMETERS

4365A **HYDROMETERS.** Sugar and Syrup, Beaumé Scale, 0 to 60°....$0.75

4365B **HYDROMETERS.** Sugar, Brix's Scale, Plain, 0 to 30 in ½° at 17½°C. 1.00

4365C **HYDROMETERS.** Sugar, Brix's Scale, with Thermometer, 16 inches long, 0 to 30 in ½° at 17½°C.... 3.50

4365D **HYDROMETERS.** Vinegar, Beaumé, 0 to 6° in 1° Graduations.. 1.00

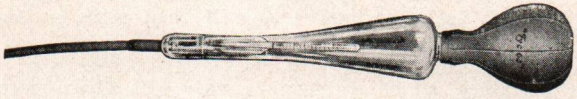
4365E **HYDROMETERS.** Spirit, U. S. I. R. Scale, with Certificate 0 to 100 in 1° Graduations.... 4.00

4365F **HYDROMETERS.** Twaddel's No. 1, 0 to 24, 1.000 to 1.120 Specific Gravity, No. 2, 24 to 48, 1.120 to 1.240 Specific Gravity, No. 3, 48 to 72, 1.240 to 1.360 Specific Gravity.... 1.00

4365G **HYDROMETERS.** Same as above, No. 4, 72 to 100, 1.360 to 1.500 Specific Gravity; No. 5, 100 to 134, 1.500 to 1.670 Specific Gravity; No. 6, 134 to 180, 1.570 to 1.900 Specific Gravity.... 1.25

4365H **HYDROMETERS.** Jars. See under Cylinders.

NOTE—Temperature is 60° Fahrenheit and the approximate length over all is 10 inches for plain and 16 inches for combined with thermometer, unless otherwise specified.



No. 4365I

CHARGOMETER—SYRINGE BATTERY HYDROMETER

What is a Chargometer?

Briefly it is a gauge for determining the state of charge in storage batteries. By its use the exact strength of batteries is known, and the inconvenience occasioned by exhausted batteries is overcome.

It's Construction

A glass tube enlarged at the upper end, to prevent the adhering of the instrument to the sides, and also to bring to a minimum the distortion caused by reading the instrument through round glass walls. There are no rubber parts to dry up and drop out. All parts are renewable if lost or broken.

It's Use

By inserting the pointed tube of a chargometer in the storage cell opening, withdrawing fluid by means of the bulb, the specific gravity is indicated by the hydrometer in the cylinder.

4365I Type 7400. Specific gravity scale, 1150 to 1300. Best quality rubber buffer in end of cylinder to prevent breakage of hydrometer. Length over all, 19 inches. Each in a wood carrying box with hinged cover.
Price .... each 3.50

4365J Type 7404. Same scale as above, 2d quality rubber bulb, without rubber buffer. Length over all, 12 inches. Each in pasteboard box
Price .... each 1.00

HYGROMETERS

4366A Various forms of this instrument have been devised for determining the amount of moisture in the atmosphere, ascertaining the relative humidity, and forecasting the probability of frost, but none with the same universal satisfaction (when the instrument is understood and proper observation taken) as the form known as Mason's Hygrometer. The construction of this instrument consists of two thermometers as nearly alike as possible in range of scale, mounted on either side of a block of polished wood with a cistern of water between. The thermometer marked dry is exposed to the air, the other, market wet, has its bulb surrounded by a piece of silk, which passes down into the opening in the cistern acting as a wick and keeping the bulb of the thermometer constantly moist. As evaporation causes a loss of heat, the wet bulb thermometer will read lower than the other, provided there is any danger of dryness in the air. When the air is very dry, the difference in their readings will be great; if moist, the difference will be proportionately less, but if the air is fully saturated, both thermometers will read alike as there can be no evaporation.

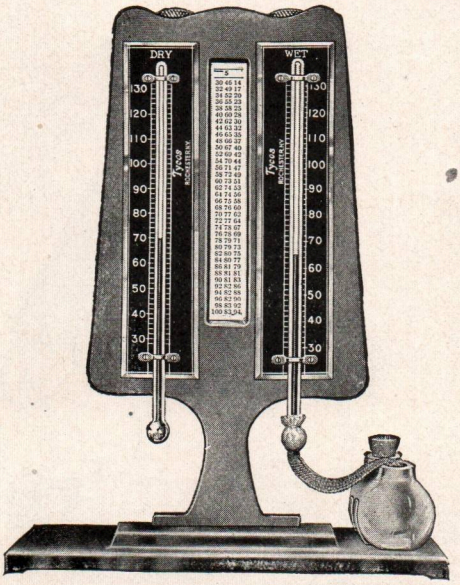
By the use of tables, which we furnish with each Hygrometer, the point at which the air would begin to deposit moisture, known as the dew point, and the percentage of saturation of the air (humidity) are readily ascertained.

(No tables are required when the "Hygrodeik" is used.)

Dew is formed by the radiation of heat from the surface of trees, plants etc., consequently reducing the temperature of the air near the immediate surface of such objects to the point of complete caturation, causing moisture to be deposited. The Hygrometer therefore becomes of the greatest value to the farmer and florist, since in the hands of an intelligent observer the formation of frost can be foretold with certainty, enabling him to take steps to prevent damage to delicate plants exposed to the open air. If the temperature of the air on a clear day at sundown be 50° and the reading of the wet bulb thermometer 40°, the dew point, according to the tables referred to, would be 27° and frost would follow with certainty; but should the wet bulb thermometer stand at 47° and the temperature of the air 50°, then the dew point would be reached at 44° and no frost need be feared.

In the household for maintaining a degree of healthful humidity; in the sick chamber, where by its use any degree of moisture will be indicated, in many branches of manufactures, as cotton carding, incubating, in drying rooms, malt houses and greenhouses, it is gradually being recognized as an indispensable instrument.

HYGRO-AUTOMETER



No. 4367A

(Copyrighted)

A Practical, Easy-reading Hygrometer

Directions for Use

To find the relative humidity, turn the roll until the number at the head of the column corresponds to the difference of the readings of the Wet and Dry Bulb Thermometers, then follow down the first row to the number corresponding to the reading of the Dry Bulb. The figures on the same line in the second row will indicate the relative humidity.

Each

4367A *Tycos* Hygro-Autometer. Type No. 5558. ..... $ 9.00
Black-japanned iron frame 8½x6 inches. Approximate scale range 20° to 120° Fahrenheit.

4367B. Same as Type 5558, except with polished brass frame. Type No. 5558A. 10.50
Extra silk wicks, per doz. 1.20

Tycos MASON'S FORM HYGROMETER

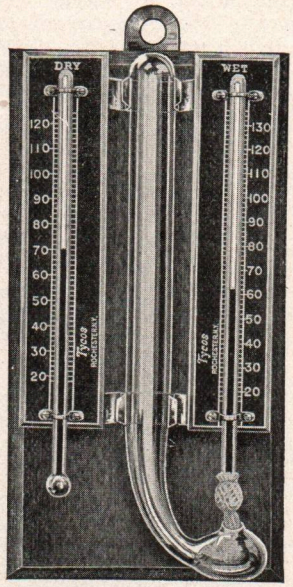
Instruments of the form illustrated herewith, commonly known as the Mason's Hygrometer, consisting of a pair of accurate thermometers, suitably mounted and provided with reservoir to supply water to the so-called Wet Bulb by means of wicking, offer the only dependable means for determining the moisture conditions of the air.

Each

4367C *Tycos* Hygrometer (Mason's Form). Type No. 5532. ..... $4 50
On hardwood panel 8½x4½ inches; range 10° to 120° Fahrenheit, in 2° graduations.

4367D *Tycos* Hygrometer (Mason's Form). Type No. 5533 ..... 6.00
On metal panel 8½x4½ inches; rangs 60° to 220° Fahrenheit, in 2é graduations.
Extra Silk Wicks, per doz. 1.20

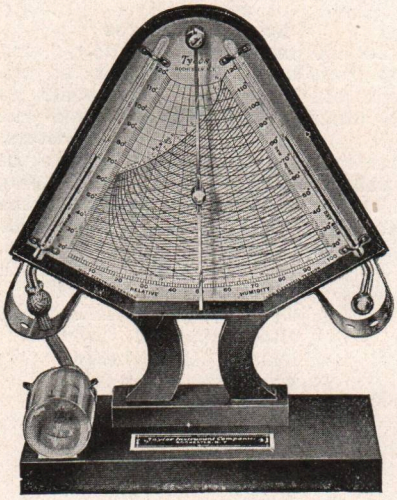
With each instrument we supply copy of U. S. Weather Bureau tables and directions for determining humidity, etc. If complete tables are desired, apply to United States Department of Agriculture. Weather Bureau, Washington, D. C., for Psychrometric Tables, W. B. No. 235. Price, 10c.



No. 4367C

THE *Tycos* HYGRODEIK

(Copyrighted)



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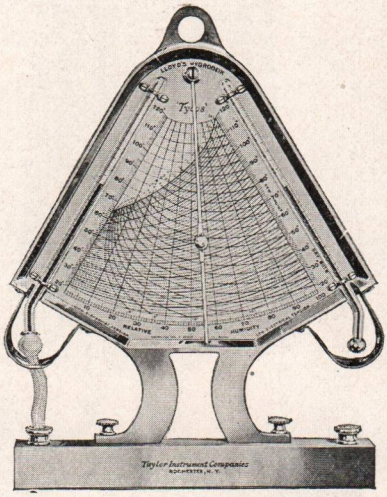


No. 4368C

Directions for Operating

To find the relative humidity, swing the index hand to the left of the chart and adjust the sliding pointed to that degree line upon the chart which corresponds to the degree of temperature shown upon the engraved stem of the Wet Bulb Thermometer. Then swing the index hand to the right, until the sliding pointer intersects the curved line which extends downward to the left from the degree line upon the chart corresponding to the indicated temperature of the Dry Bulb Thermometer. At this intersection the index hand will point to the relative humidity on the scale at the bottom of the chart.

Standing Form

4368A *Tycos* Hygrodeik. Type 1300 A. ..... Each $13.50
Frame of polished brass; chart engraved on crown-nickel; range of scales 20° to 120° Fahrenheit, in 1° graduations.

4368B *Tycos* Hygrodeik. Type 1301A 13.50
Same as Type 1300 A, except with range of scales 80° to 180° in 1° graduations.

Hanging Form

4368C *Tycos* Hygrodeik. Type 1305 ..... 15.00
Frame of polished brass; chare engraved on crown-nickel; range of scales from 20° to 120° Fahrenheit, in 1° gradu ations,

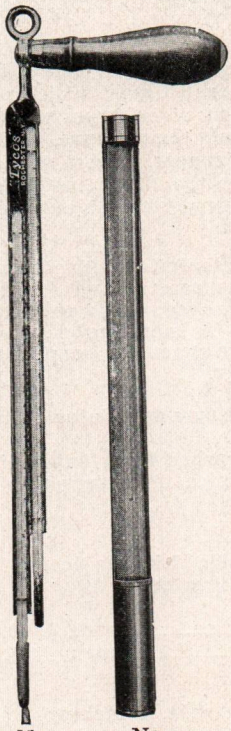
4368D *Tycos* Hygrodeik. Type 1306 ..... 15.00
Same as Type 1305, except with range of scales 80° to 180°, in 1° graduations.

Extra Engraved Stem Thermometers for above 2.50
When ordering extra Engraved Stem Thermometers specify temperature range and whether wet or dry side is wanted.
Types 1300A, 1301A, 1305 and 1306 will be furnished with scale graduations in Centigrade if so specified on order.

Tycos SLING PSYCHROMETER, OR HYGROMETER

The instrument herewith is a modification of the pattern developed by the U. S. Weather Bureau. The fact that our design has been generally copied is good evidence of its practicable features.

The advantage of this form of Wet and Dry Bulb Hygrometer over the stationary form is the facility with which tests can be made quickly, and the accuracy of the readings obtainable, as in whirling the bulbs they are subjected to perfect circulation.



No. 4369A No. 4369B

HOW TO USE

Keep a glass of clean water in the room in which the test is to be made, with its temperature as near as possible to that of the room. Saturate the fabric covering the extended bulb, then whirl the instrument for 15 or 20 seconds, holding it away from the influence of the body heat. Stop, and note the indication of Wet Bulb Thermometer, then repeat the operation until two or more readings agree, to insure the lowest indication obtainable. To secure reliable indications the wicking must be kept perfectly clean and thoroughly saturated.

TO DETERMINE HUMIDITY WITH THE *Tycos* SLING PSYCHROMETER, FOR TEMPERATURE BELOW THE FREEZING POINT.

At temperatures below freezing, the Wet Bulb Thermometer must be treated in the following manner: Water must be applied sparingly to the bulb with a camel's-hair brush; a thin coating of ice will then be formed on the fabric covering the bulb, and evaporation from the frozen surface will go on as before.

4369A *Tycos* **SLING PSYCHROMETER.** Type 1322. Each ..... $ 9.00
With 12-inch engraved stem thermometers, graduated 0° to 100° Fahrenheit in ½°.
Copper case as illustrated, supplied with each instrument, to protect thermometer tubes when not in use.

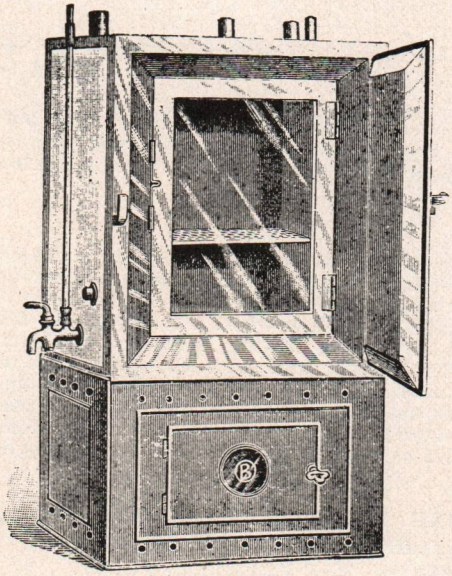
4369B Extra Engraved Stem Thermometers for above. Each 3.00

4369C *Tycos* **POCKET SLING PSYCHROMETER.** Type 1323. Each 10.50
Seven inches long, with chain sling. 5-inch engraved stem Thermometers, graduated 0° to 100° Fahrenheit in 1°, complete with leather carrying case.

4369D Extra Engraved Stem Thermometer for above, each 3.00

With each instrument we supply copy of U. S. Weather Bureau tables and directions for determining humidity, etc. If complete tables are desired, apply to United States Department of Agriculture, Weather Bureau, Washington, D. C., for Psychrometric Tables, W. B. No. 235. Price, 10 cents.

BACTERIOLOGICAL INCUBATORS
TRIPLE WALL



No. 4370A

Incubator, three walls, made of highly polished copper with conical bottom, having both air and water space, the outer surface being covered with insulating material to insure an even temperature, and the exposed copper parts are lacquered to prevent tarnishing.

It is provided with two doors, the inner one of beveled glass which permits observation of cultures, without disturbing the temperature. The outer door, of copper, double wall, is primitive, properly fitted, with felt buffers to insure perfect fit and close contact.

There are tubulations for thermo regulator, thermometer and for filling into water space; these are properly marked. A metal tube passes through the air space for connecting with gas supply.

The control of temperature in the air space is affected by a ventilator on top of the oven.

The incubator is supported on a sheet iron base, 10 inches high, finished in dull black, having a door, with an opening covered with mica for observation of the flame.

INCUBATOR—with one shelf.
Inside dimensions, 9 inches high, 7 inches wide, 7 inches deep.
Outside dimensions, 13 inches high, 11 inches wide, 10½ inches deep.

4370A	Gas. Type 1270	each	$ 60.00
4370B	Electric. Type 1270A	each	95.00

INCUBATOR—with one shelf.
Inside dimensions, 12 inches high, 9 inches wide, 9 inches deep.
Outside dimensions, 17 inches high, 14 inches wide, 13 inches deep.

4370C	Gas. Type 1272	each	62.00
4370D	Electric. Type 1272A	each	115.00

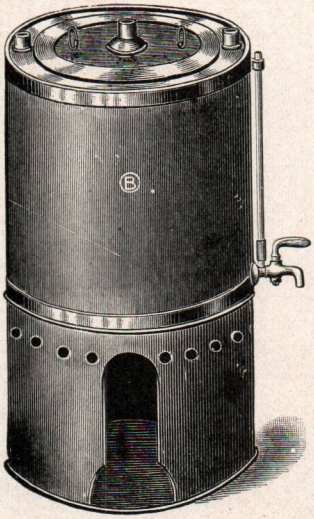
INCUBATOR—with two shelves.
Inside dimensions, 14 inches high, 12 inches wide, 10 inches deep.
Outside dimensions, 19 inches high, 15 inches wide, 14 inches deep.

4370E	Gas.	66.00
4370F	Electric	130.00

NOTE—Larger sizes, prices on application.

BACTERIOLOGICAL INCUBATORS

DOUBLE WALL



No. 4371A

No. 4371B

4371A **INCUBATOR, DOUBLE WALL,** suitable for physicians and others who desire to make only a small number of cultures at a time. It is made of polished copper, having a 2-inch water space and is covered with an insulating material, provided with water gauge and stop-cock, and also has a perforated tray. Type 1310.

The glass plate in top of incubator prevents a sudden change in temperature when opening the lid to examine the culture; inside measurement 8 by 9 inches, outside measurement 12 by 12 inches. The base is made of sheet iron, and is 9 inches high.

Price .....each $25.00

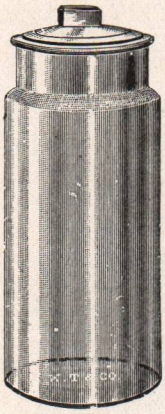
4371B **INCUBATOR, DOUBLE WALL,** with two shelves, made of polished copper, and lacquered to prevent tarnishing. It has a 1½-inch water space, provided with double doors, the inner of glass and the outer of copper; also has a water gage, stop-cock and tubulations for thermo-regulator and thermometer, supported on an enclosed sheet iron base 10 inches high. Inside dimensions, 10 inches high, 12 inches wide and 10 inches deep; outside dimensions, 13 inches high, 15 inches wide and 13 inches deep. Type 1315.

Price .....each $45.00

JARS

SPECIMEN

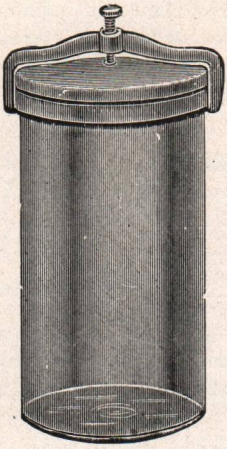
4372A **JARS, SPECIMEN,** clearest flint glass. With mouths nearly as wide as the jars themselves, and glass stoppers carefully ground in.



No. 4372A

Diam. of Body	Height to Shoulder	Height to top of Stopper	Width of Mouth	Capacity to Neck	Price Each
1½ in.	2 in.	3½ in.	1¼ in.	1½ oz.	$ .52
1½ in.	3 in.	4½ in.	1¼ in.	2½ oz.	.55
2 in.	2½ in.	4¼ in.	1½ in.	3 oz.	.57
2 in.	3¾ in.	5½ in.	1½ in.	5 oz.	.60
2 in.	5 in.	6¾ in.	1½ in.	6 oz.	.70
2½ in.	3½ in.	5½ in.	2 in.	8 oz.	.75
2½ in.	5 in.	7 in.	2 in.	11 oz.	.80
2½ in.	7 in.	9 in.	2 in.	16 oz.	.85
3 in.	4 in.	6¼ in.	2½ in.	14 oz.	.90
3 in.	6 in.	8¼ in.	2½ in.	20 oz.	1.05
3 in.	8 in.	10¼ in.	2½ in.	28 oz.	1.50
3¾ in.	6 in.	8½ in.	3 in.	29 oz.	1.65
3¾ in.	8 in.	10½ in.	3 in.	40 oz.	2.00
3¾ in.	10 in.	12½ in.	3 in.	52 oz.	2.40
4½ in.	5 in.	7¾ in.	3½ in.	38 oz.	2.00
4½ in.	8 in.	10¾ in.	3½ in.	62 oz.	2.50
4½ in.	12 in.	14¾ in.	3½ in.	92 oz.	3.00
6 in.	7 in.	10 in.	5 in.	98 oz.	3.60
6 in.	10 in.	13 in.	5 in.	140 oz.	4.70
6 in.	12 in.	15 in.	5 in.	168 oz.	5.25
6 in.	15 in.	18 in.	5 in.	212 oz.	6.00

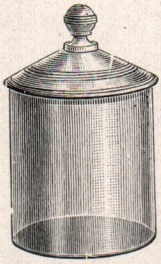
4372B **JARS, SPECIMEN,** Improved. Top plate with hook. Ground to the top and made air-tight by a rubber washer and clamp.



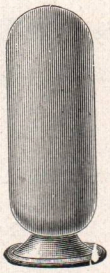
No. 4372B

Width of Mouth.	Height without Lid.	Capacity, Approx.	Each
2¼ inches	4 inches	½ pint	$1.15
2¼ inches	6 inches	¾ pint	1.20
2¼ inches	8 inches	1 pint	1.25
2¼ inches	12 inches	1½ pint	1.40
2¼ inches	18 inches	2¼ pint	1.75
3½ inches	6 inches	1¾ pint	1.60
3½ inches	8 inches	2½ pint	1.80
3½ inches	12 inches	4 pint	2.10
3½ inches	18 inches	6 pint	2.50
5 inches	8 inches	2¾ quarts	3.25
5 inches	12 inches	4 quarts	3.75
5 inches	15 inches	5 quarts	4.00
5 inches	18 inches	6 quarts	4.30
6¼ inches	8 inches	1 gallon	4.10
6¼ inches	12 inches	1½ gallon	4.55
7⅝ inches	6 inches	1⅛ gallon	6.00
7⅝ inches	8 inches	1½ gallon	6.30
7⅝ inches	12 inches	2¼ gallon	7.25
7⅝ inches	15 inches	2¾ gallon	7.85
7⅝ inches	18 inches	3½ gallon	8.40
7⅝ inches	24 inches	4½ gallon	9.65
7⅝ inches	36 inches	7 gallon	12.75
11½ inches	12 inches	4¾ gallon	14.90
11½ inches	18 inches	7¼ gallon	18.80
11½ inches	24 inches	10 gallon	23 50

JARS



No. 4373A



No. 4373B

No. 4373C

No. 4373D

4373A **JARS, STORAGE.** Plain round jars, pressed glass lids.

Capacity ....gals.	¼	½	1
Each	$1.00	1.50	2.00

4373B **JARS, SHOW BOTTLES.** Inverted, for ore samples.

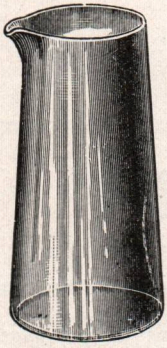
Capacity ....oz.	4	8	16	32	128
Each	$0.30	.35	.45	.70	2.50

4373C **JARS, SCREW-CAPPED.** Nickel-plated cover, high form.

Capacity ....oz.	4	8	16
Dozen	$2 25	2.75	4.25

4373D **JARS, SCREW-CAPPED.** Nickel-plated cover, low form.

Capacity ....oz.	1	2	4
Dozen	$2.00	2.50	4.00



No. 4373E

No. 4373F

4373E **JARS, PRECIPITATING.** With lip, stout glass.

Capacity ..pts.	¼	½	1	2	4	8	16
Each	$0.40	.50	.65	.90	1.25	1.75	3.50

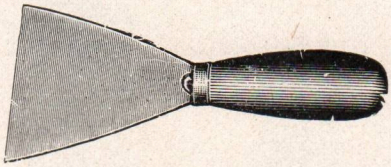
4373F **JARS, STONEWARE.** With handles and cover, waste jars.

Capacity ....gals.	1	2	3	4	5
Each	$0.65	.90	1.05	1.80	2.25

JARS, HYDROMETER. See Cylinders.

JARS, NESSLERS. See Cylinders.

KNIVES, LABELS, ETC.



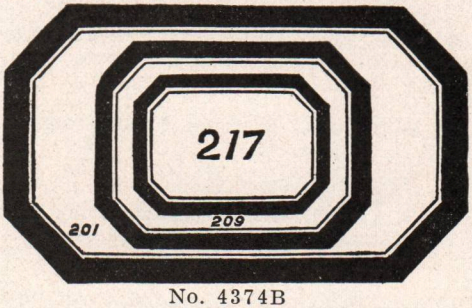
No. 4374A

KETTLES, AMALGAM OR QUICKSILVER. See Buckets.

KIPPS GENERATORS. See Generators.

4374A **KNIVES, AMALGAM.** With handle, blade three inches wide, for cleaning amalgam plates $0.60

KNIVES, CORK. See Cork.



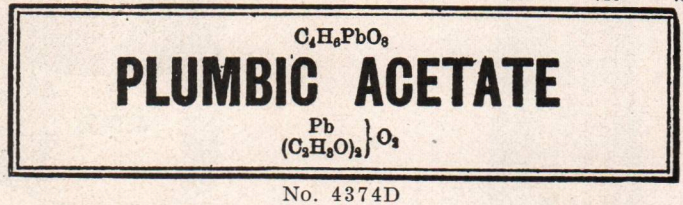
No. 4374B

4374B **LABELS, GUMMED PAPER, DENNISON'S.**

No.	201	205	209	217	219	223	229	239	241	259	261
Box	$0.20	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20

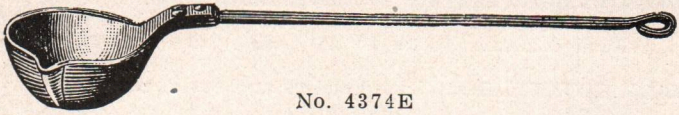
4374C **LABELS, GUMMED PAPER, DENNISON'S.**

No.	2004	2007	2002	2001	2006	2005	2003
Size....inches	2¾x1	2⅞x1⅝	3⅞x1	3⅞x1½	4x1⅝	4x1⅞	4¾x2
Box	$0.30	.35	.35	.40	.45	.50	.55



No. 4374D

4374D **LABEL BOOKS.** Containing an assortment of the most commonly wanted labels, giving names and chemical symbols, may be easily removed from the book, perforated; each $0.75

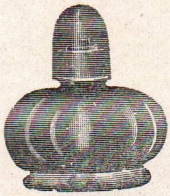


No. 4374E

4374E **LADELS.** Wrought iron with lip.

Diameter .....inches	2½	3	4	5	6
Each	$0.70	.90	1.25	1 60	2.00

LAMPS



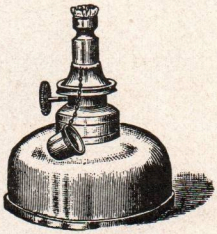
No. 4375A

4375A **LAMPS, ALCOHOL.** Glass. With ground-on cap, wick and wick holder.

Capacity ....oz.	2	4	8
Each	$0.30	.35	.40

4375B **LAMPS, ALCOHOL.** For Denatured Alcohol. Made of nickel-plated brass, and readily adjustable, giving a blue and intenselyhot flame. Diameter, 6⅜ inches, Height over all 5½ inches. Each $3.50

No. 4375C



No. 4375E

4375C **LAMPS, ALCOHOL.** Glass, with nickel-plated screw caps, wick and wick holder. A vast improvement over the ordinary lamp.

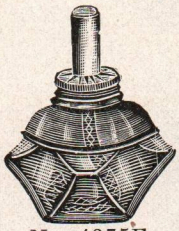
Capacity ....oz.	2	4	8
Each	$0.30	.50	.60

4375D **LAMPS, ALCOHOL.** Of polished brass, with new top and metal cap, 4 ounce capacity. Each $1.00

4375E **LAMPS, ALCOHOL.** Brass, with ratchet burner.

Capacity ....oz.	3	5
Each	$0.60	.75

No. 4375G



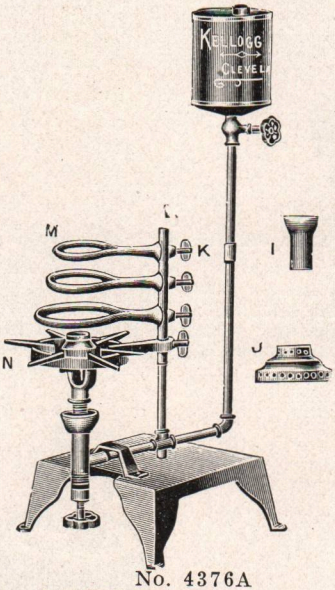
No. 4375F

4375F **LAMPS, ALCOHOL.** Clark's. Glass, faceted body, permitting the use of the lamp in several positions.

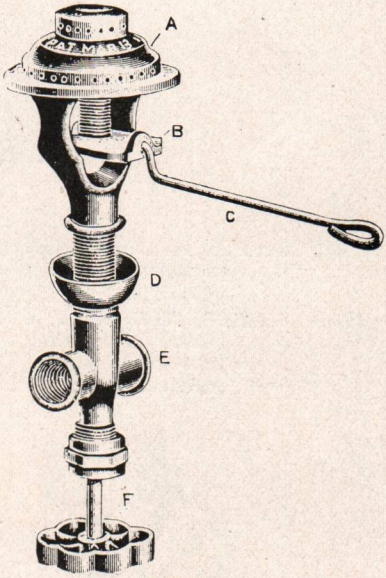
Capacity ....pts.	2	4	4
Burner ....inches	3/16	¼	½
Each	$0.90	1 15	1.25

4375G **LAMPS, JEWELERS', SPHERICAL.** Adjustable to any position.
Small size....$1.30 Large size....$2.00

LAMPS



No. 4376A

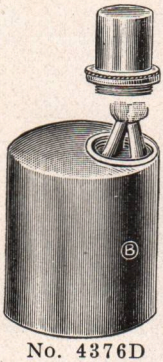


No. 4376C

4376A **LAMPS, KELLOGG'S.** For gasoline. Indispensable where a Bunsen Burner flame is required and no gas available. It gives as much heat as several Bunsen Burners, and is better than alcohol lamps. There is no smell, as the gas is consumed as soon as produced, no wick necessary. Complete, as per engraving $12.00

4376B Burner only, for above lamp 7.50

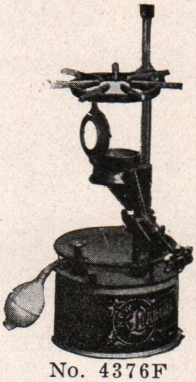
4376C **LAMPS, KELLOGG'S NEW VAPOR LAMP.** Can be used in sets of two or more lamps, using the same tank 3.00



No. 4376D

4376D **LAMP.** For sperm oil. Polished brass, wick-holder lifts out. Type 1930 ..... each $1.50

4376E **LAMP.** Same, but nickel-plated. Type 1935. Each 1.75



No. 4376F

4376F **LAMPS. Danglers' Laboratory.** For gasoline.

Price, with tin tank ..... each $10.00

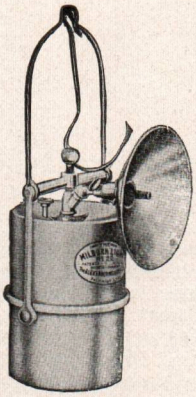
Price, with copper tank ..... each 11.00

4376G **BURNER.** For above, only ..... each 3.00

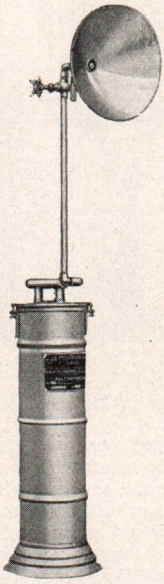
4376H **EXTRA RUBBER BULB.** For same ..... each .40

4376I **EXTRA CONES OR GRATES.** For same ..... each .25

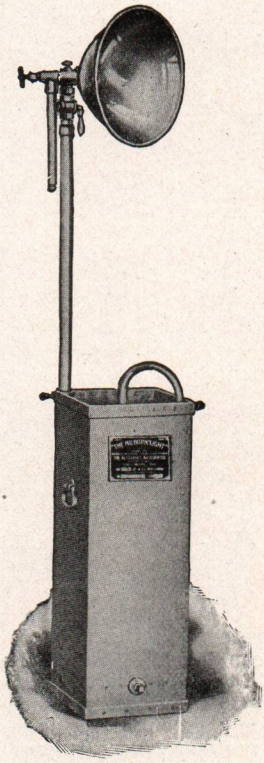
MILBURN PORTABLE LAMPS



No. 4377A



No. 4377D



No. 4377I

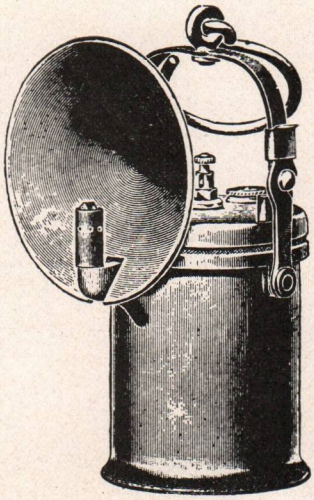
Milburn Acetylene Portable Lamps range in size from the small 11″ Type 22 light, which gives 100 candle power to the large industrial lamps like the Type 12, which gives 12,000 candle power or Type 12 Duplex, twice as powerful.

The cost of operation is very small, owing to the simplicity of construction and the fact that these lamps burn ordinary lump carbide, the cheapest and most economical form in which carbide can be used.

PRICE LIST OF MILBURN LAMPS
Effective August 1, 1918

	Type		Candle Power	Price
4377A	8.	Standard Contractor	8,000	$ 70.00
4377B	12.	Standard Contractor	12,000	85.00
4377C	12.	Duplex "Double Burner"	20,000	110.00
4377D		Reliance Six-hour Lamp	3,000	35.00
4377E	3U.	For Steam Shovels, Cranes, etc.	15,000	98.00
4377F		Milburn Double Tractor Headlight	1,000	75.00
4377G		Milburn Single Tractor Headlight	500	60.00
4377H		Builder Hand Lamp	500	25.00
4377I	22.	Metal Mine Lamp With Open Burner	100	9.00
4377J	22.	Metal Mine Lamp With Mica Wind Shield	100	10.00
4377K	22.	Metal Mine Lamp With Aluminum Reflector	100	10.00
4377L		Trucks for Lights to be Mounted on Wheels Extra		25.00

WOLF CARBIDE LAMPS



No. 4378A

WOLF CARBIDE LAMPS

4378A In mines, tunnels, foundries, etc., oil lamps and candles have, until recent date been the principal illuminant, but neither in efficiency nor economy can they be compared with portable self-contained Acetylene lamps, leaving out of the question the far superior illuminating power obtained from the latter.

A better light than that obtained from ordinary candles or oil lamps is not only essential for many industrial purposes, but becomes a direct necessity in working places, where the life of the users depends to a great extent upon a brilliant and reliable source of light, as is the case in mines, tunnels, quarries, etc. In all countries, where mining is going on, authorities have again and again drawn attention to the necessity of the use of clear and powerful light as the most efficient means for preventing accidents by the fall of roof.

For this reason as well as for the greater efficiency in work obtained by the use of a powerful light, their low cost in upkeep, and their greater hygenic properties, Acetylene lamps have been adopted to a large extent during the last five years in mines and other industrial establishments all over the world.

Our portable hand lamps are generally made in three different sizes namely:

Size 1 with a burning capacity of 10 to 12 hrs., consuming 11 ozs. of carbide.
Size II with a burning capacity of 7 to 8 hrs., consuming 8 ozs. of carbide.
Size III with a burning capacity of 5 to 6 hrs., consuming 5 ozs. of carbide.

CONSTRUCTION AND MATERIAL OF WOLF ACETYLENE LAMPS

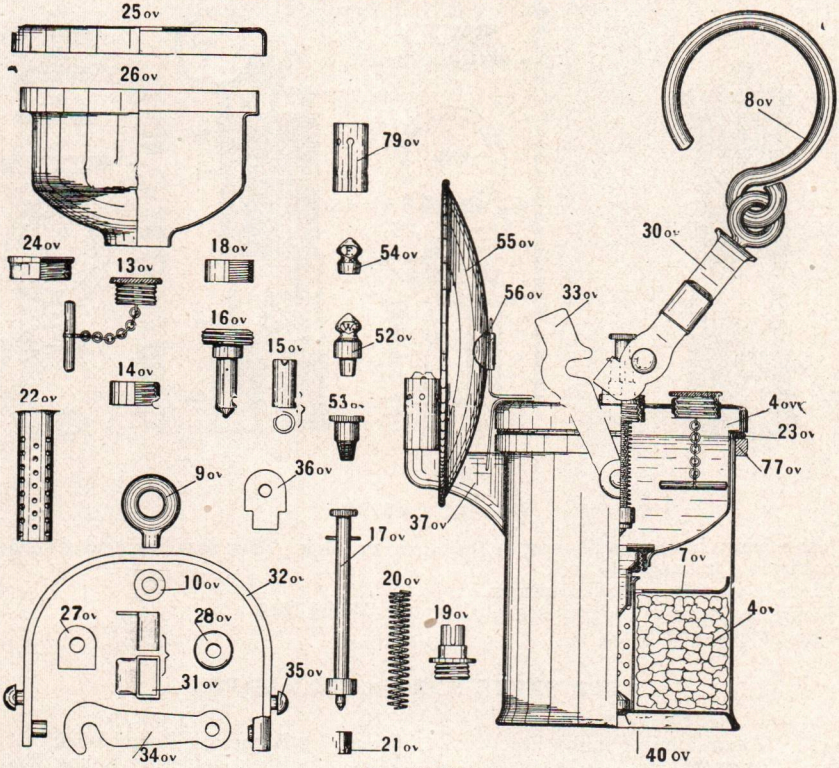
All our lamps are of greatest durability and will withstand any strain they are likely to be exposed to during practical use. Both carbide and water holder are pressed from the best possible sheet steel, without any seam whatever, whereby the greatest strength and stability is obtained. While the ordinary working lamps are made of 1/6 in. sheet steel, we also supply lamps entirely of brass, free from any iron parts, for surveying purposes, etc.

Lamps can be delivered with sharp hook if requested.

WOLF'S CARBIDE LAMPS

DIAGRAM OF PARTS OF LAMP NO. 586

(Made in 3 sizes in steel and brass.)



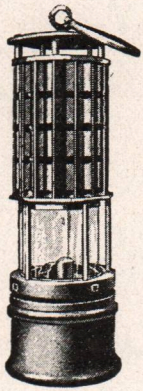
No. 4379A

NAMES OF THE SINGLE PARTS

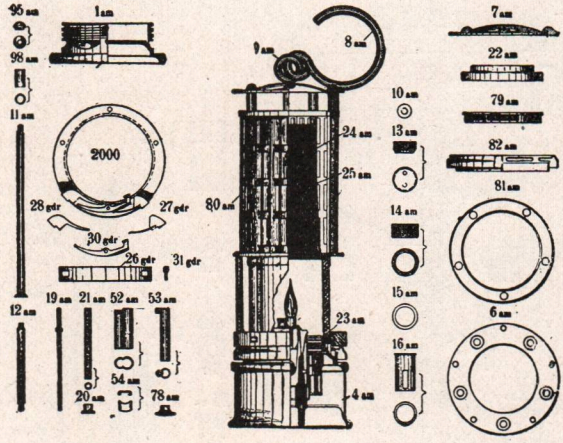
(When ordering specify for what size steel or brass lamp)

No. 4 ov—Complete carbide holder.
No. 4 ovw—Complete water holder.
No. 7 ov—Sheet cover for carbide.
No. 8 ov—Lamp hook, round or sharp.
No. 9 ov—Eyelet.
No. 10 ov—Washer.
No. 13 ov—Screw plug with chain.
No. 14 ov—Bush for same.
No. 15 ovst—Pins for water dropper.
No. 16 ov—Water dropper.
No. 17 ov—Water plug spindle.
No. 18 ov—Bush for same.
No. 19 ov—Spindle screw.
No. 20 ov—Spiral spring for water spindle.
No. 21 ov—Rubber washer for water spindle.
No. 22 ov—Water distributing tube.
No. 23 ov—India rubber washer.
No. 24 ov—Bush for water dropper.
No. 25 ov—Cover for water holder only.
No. 26 ov—Water holder only.
No. 28 ov—Washer for shanks.
No. 30 ov—Complete locking bridle.
No. 31 ov—Locking slider.
No. 32 ov—Bridle with 2 shank pins.
No. 33 ov—Right shank.
No. 34 ov—Left shank.
No. 35 ov—Shank pin.
No. 36 ov—Bridle bracket.
No. 37 ov—Burner bracket.
No. 40 ov—Stud for water distributing tube.
No. 52 ov—Burner, upper part (878).
No. 53 ov—Burner, lower part (881).
No. 54 ov—Burner, only (lava tip) (879).
No. 55 ov—Reflector (863).
No. 56 ov—Reflector holder.
No. 77 ov—Strengthening ring for carbide holder.
No. 79 ov—Protecting tube for burner.

WOLF MINERS' SAFETY LAMPS



EXTRA PARTS FOR No. 100 LAMPS



No. 100 LAMPS

These lamps have round burner, taking air from below. They have corrugated shield, internal igniter and magnetic lock.

Made in steel, brass and aluminum.

Lamps equipped with our metal spark igniter, Model 1914.

Prices upon application.

EXTRA PARTS FOR No. 100 LAMPS

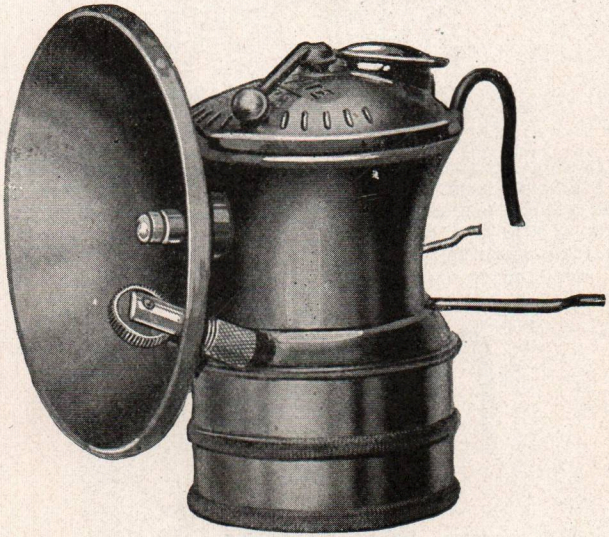
No.	Name of Part
1 am.	Top of Lamp Fount
4 am.	Lamp Fount
6 am.	Middle Ring
7 am.	Dome Top of Lamp
8 am.	Handle of Lamp
9 am.	Eyelet
10 am.	Washer
11 am.	Rods with Screw Heads
12 am.	Rods Fronting Glass Chimney
13 am.	Filling Hole Stopper
14 am.	Filling Hole
15 am.	Leather Washer
16 am.	Cylindrical Cotton Spreader
19 am.	Wick Adjuster
20 am.	Bushing
21 am.	Wick Adjuster Guide Tube
22 am.	Gauze Ring
23 am.	Expansion Ring
24 am.	Outer Wire Gauze
25 am.	Inner Wire Gauze
52 am.	Burner for Round Wick
53 am.	Wick Holder for Round Wick
54 am.	Wick Stop for Round Wick
78 am.	Wick Adjuster Knob
79 am.	Air Admission with Double Wire Gauze
80 am.	Corrugated Shield
81 am.	Strengthening Ring for Shield.
82 am.	Protecting Ring for Admission
95 am.	Nut for 11 am.
98 am.	Tube for Fastening 81 am.

ORDINARY MAGNETIC LOCK

2000	Complete Magnetic Lock
26 gdr.	Protecting Plate
27 gdr.	Anchor Spring and Spring Pole
28 gdr.	Anchor Pole
30 gdr.	Anchor Beam
31 gdr.	Anchor Screw

When ordering extra parts, please state whether same are required for a steel, brass, aluminum lamp.

LAMPS

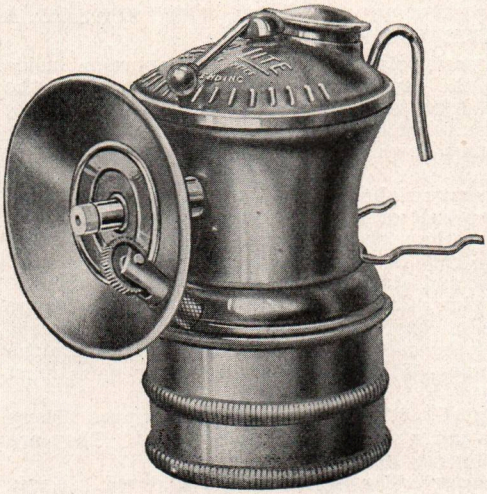


No. 4381A

Auto-Lite lamps are light in weight, strong and durable; give a brilliant steady light, without smoke, grease or sparks.

4381A Polished brass with large reflector. Lamp only. Type 102.

Price on application.



No. 4381B

4381B Type 101. Polished Brass, Nickel Reflector. Packed with extra carbide container.

4381C Type 101X Polished Brass, Nickel Reflector. Lamp only.

Prices on application.

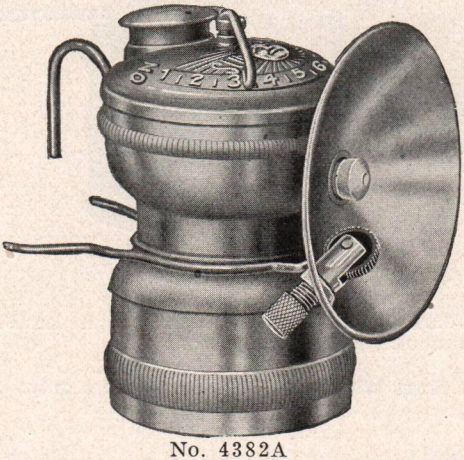
SUN RAY

CARBIDE MINE LAMPS

POLISHED NICKLE

Sun Ray Lamps are made of heavier brass, yet weigh less than other lamps. The heavier material used must necessarily mean a stronger lamp and this added strength without excess weight must be an advantage for the Sun Ray.

The weight of the Sun Ray is kept down by the elimination of every non-essential part. An examination of this lamp will show that there are no frills, no decorative parts and no excess solder.



No. 4382A

SOME OF THE DISTINCTIVE POINTS THAT MAKE THE SUNRAY A BETTER LAMP

WATER CAP—The water cap is positively non-leakable. A diaphragm inside the cap holds any water forced into the cap due to excess pressure, until the pressure is relieved, when the water drips back into the tank. Water will not leak out of this cap even if the lamp is tured upside down. This positively overcomes the old trouble of water running down the miner's face or the back of his neck.

HOOK—The hook is turned at a sharp right angle inside the water tank and lies in recess or embossing, about one half of the thickness of the wire. This makes it possible to very securely fasten the wire inside of the water tank.

KNURLING—The knurling on the carbide container is made extra wide, affording a better grip, as well stiffening and strengthening the container.

REGULATING LEVER—The position of the regulating lever, when the lamp is burning, varies with every lamp, so we have numbered the notches on the top of the water tank to make it easier for the user to remember the point where the lever should be set to get the best flame. With all other lamps, this point must be guessed at.

BURNER—The Sun Ray is equipped with our Kra-Ker-Jak burner. These burners can be taken off or put on in half a minute—no tools needed. They are so easily replaced that the job can be done in the dark.

REFLECTOR COLLAR—The reflector collar is riveted, not soldered. It cannot break loose and it weighs less than a soldered collar or a locknut.

PIONEER CARBIDE LAMPS

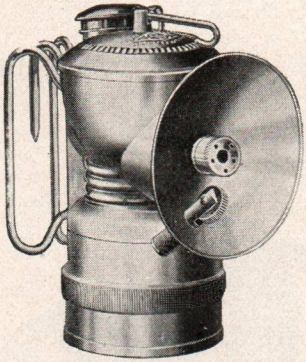
No. 4383A

Type 130

With Straight Wire Feed and Water Shutoff

4383A **LAVA BURNER**—Rigid removable reflector. Height 4", weight 5½ ozs. Has tin reflector 2½" diameter, ½" deep, with spark lighter.

This lamp and the type 229 operate with the old reliable straight wire feed that gives an even, steady flame without constant regulation. They are equipped with the no-trouble valve, practically unbreakable. The valve tube works inside of a second tube which is securely fastened to the top and bottom of the water tank, relieving these two parts of all strain, when valve is opened and closed.



No. 4383B

Type 229

With Straight Wire Feed and Water Shutoff

4383B **LAVA BURNER**—Rigid Removable Reflector. Weight, 5¾ ozs, Height 4½".

A convenient lamp for inspectors, superintendents, shift bosses, etc., in fact for all purposes where a handle lamp can be used.

Has polished nickle reflector 2¾" diameter ½" deep with spark lighter. A feature that adds considerably to this lamp is the Wind Shield. This attachment screws into the burner tube and protects the flame from draughts and heavy air currents.

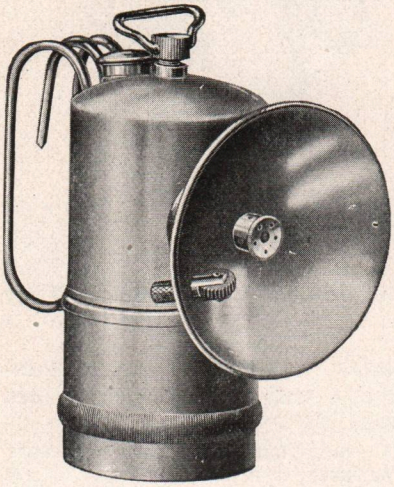
PARTS FOR 130-229 CAP LAMPS

Part No.		Doz.
2	Raking wires	$ .15
3	Lid of water tank and hinges	.50
7	Burners (all lava)	.25
8	Sparkers, complete	1.80
9	Felts	.12
10	Strainers	.30
12	Gaskets	.20
13B	Carbide containers, brass	2.40
14	Strainer clips	.10
15	Valves. See illustration above	2.00
16	Valves, stems only. See illustration above	1.00

FLOAT ITP IT'S TROUBLE-PROOF FEED

CARBIDE HAND LAMPS

FLOAT FEED CARBIDE HAND LAMPS



No. 4384A

Lava Burner

Rigid Removable Reflector

Weight, 11 ozs. Height, 5¼ ins.

Type 160

4384A Made of seamless drawn brass, heavily nickel-plated. Will be found the best superintendent's and inspector's lamp on the market. Fitted with N. P. reflector, 3 3/16-inch diameter, 1¼ inch deep, spark lighter and wind shield.

No. 4384B

Lava Burner
Rigid Removable Reflector

Type 205

4384B Weight 19 ozs. Height of lamp 6½ ins. Height to top of Bail 9¾ ins.

Made of drawn steel heavily tinned. Extra strong and especially strengthened at all points where the greatest strain occurs. Fitted with nickel plated reflector, 3 3/16-inch diameter 1¼-inch deep, spark lighter and wind shield.

Lamps No. 160 and No. 205 operate with the ITP float feed and amazingly simple construction that automatically delivers the water and rakes the carbide according to the exact requirements.

REPAIR PARTS

LAVA BURNER
Plain End

No. 4385A

All lava. Type 7. Fits all lamps.
Per dozen $0.25

KRA-KER-JAK BURNER

No. 4385B

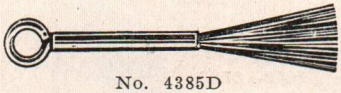
Can be taken out of lamp and put on without the use of tools. This is so easily done that the change can be made in the dark as handily as in daylight. Fits all cap lamps. Packed 2 doz. to a carton. Per dozen.....$0.35

LAVA BURNER
Air Hole

No. 4385C

All lava. Type 7-0. Fits all lamps.
Per dozen $0.25

BURNER CLEANER

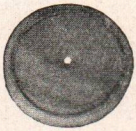


No. 4385D

Wires can be used as a brush to remove dirt, or a single wire used separately to clean the gas outlet. Type 62. For all lamps.

Each $0.05

FELT

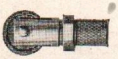


No. 4385E
All Wool Felt

For cap lamp, 1½′ diameter. For hand lamp, 1⅝′ diameter.

Type 9.	Doz.
Camp lamp	$0.12
Hand lamp	.18

STRAINER

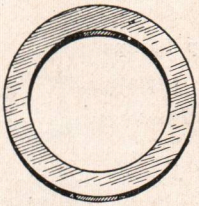


No. 4385F

Strainer or felt holder. Made of brass. Easy to put on and take off.

Type 10.	Doz.
Camp lamp	$0.30
Hand lamp	.50

RED RUBBER GASKET

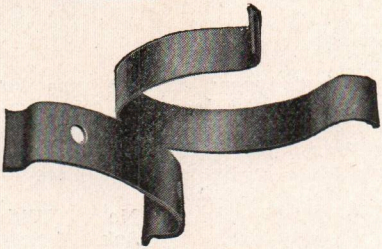


No. 4385G

Made of high-grade rubber. These gaskets are made for us under a special formula and contain little or no sulphur. Too much sulphur in rubber causes it to age or harden too rapidly, thus making it useless. The more sulphur the quicker it becomes hard. An excess of sulphur is shown when a white powder appears on the surface of the gasket. The color of our gasket never changes and it will remain soft and pliable for several years, whereas the white or gray rubber gaskets harden in a few months. Our gaskets cost no more than those of poor quality. Insist on getting a Dewar Red Gasket. Type 12.

	Doz.
For cap lamps	$0.20
For hand lamps	.75

CAP CLIP



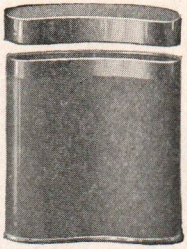
No. 4385H

This clip takes the place of the spreader wires on the lamp. When used on the regulation miner's cap the clip snaps on to the tin shield of the cap. If it is to be used on a hat the snaps can be cut off and clip fastened to hat by means of rivets or staples and in this same manner the clip can be fastened to the lapel of the coat if lamp is to be used suspended from the buttonhole in the lapel.

The clip will hold the lamp securely and the lamp can be snapped into place or removed with the greatest ease. Type 75.

Each $0.15

CARBIDE CANS



No. 4385I
Type 308

		Doz.
301A	8 oz. hinged top	$1.50
303	½ lb. slide top	.80
308	10 oz. flange cover	1.75

REPAIR PARTS

REAMER

No. 4386A

Made of imported steel. For all burners. Type 65.

Reamers only, doz. $0.60

REAMER CASE

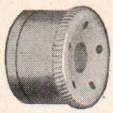
No. 4386B

Made of seamless brass, nickel-plated. Holds one dozen reamers. Type 65A.

12 Reamers in Case $0.65

WIND SHIELD

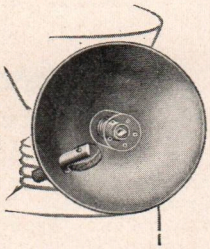
Type 76



No 4386C

4386C When you use this shield heavy air currents cannot blow out the flame. Drip will not get into the burner and put out the flame, and the lamp will hold its light when heavy shots are fired. Type 76.

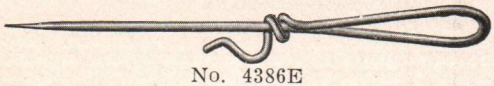
Dozen $1.20



No. 4386D

CANDLE STICKS

For Hand Lamps



No. 4386E

For Cap Lamps

No. 4386F

	Type		Doz.
4386E	73	Candle stick for cap lamps	$3.00
4386F	72	Candle stick for hand lamps	2.40

REFLECTORS

We make two distinct types; the flat type for general diffusion of light or the deep type for a partial protection against cross-currents. The flat type in four sizes: In Brass, Nickel-plate or Tin. The deep type in four sizes: In Brass, Nickel-plate or Tin.

No 4386G

Flat Deep

Type		No Spk. Dz.	With Spk. Dz.
3	Deep 3″ diameter N. P., 1¼″ deep	$3.00	$4.00
4	Deep 2¼″ diameter N. P., ¾″ deep	1.50	3.30
5	Brass flat 3 3/16″ diameter, ¾″ deep	3.00	4.80
5	N. P. flat 3 3/16″ diameter, ¾″ deep	3.00	4.80
6	Hood brass 2″ diameter, ¼″ deep	1.80	3.60
7	Tin flat 2½″ diameter, ½″ deep	.25	2.05
8	Brass flat 2¾″ diameter, ½″ deep	1.75	3.55
9	Tin deep 2⅛″ diameter, ¾″ deep	.25	2.05
Reflector for No. 200, red enamel, 4½″ diameter, 1½″ deep		4.20	6.00

LAMPS

PARTS FOR NO. 15

SUN RAY

CAP LAMP

VALVE COMPLETE

CONSISTING OF VALVE LEVER WITH BUTTON

Part No.		Doz.
2	Raking wire and button	$ .15
3	Lid of water tank and hinges	.50
7	Burners (all lava)	.25
	Kra-Ker-Jak burners	.35
8	Sparkers, complete	1.80
9	Felts	.12
10	Strainers	.30
12	Gaskets	.20
13B	Carbide containers, brass	2.40
14	Strainer clips	.10
15	Valves.	2.00
16	Valves, stems only.	1.00

PARTS FOR FLOAT ITP IT'S TROUBLE-PROOF FEED HAND LAMPS

	Doz.
Wire rod	$ .60
Lid of water tank and hinges	.60
Burner tubes	.25
Burners (all lava)	.25
Kra-Ker-Jak burners, packed 2 doz. to a carton	.35
Sparkers, complete	1.80
Felts	.18
Strainers	.50
Strainer clips	$ .15

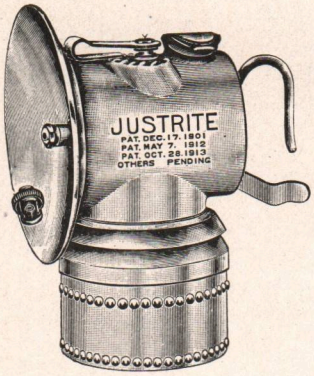
	Doz.
Gaskets	.75
Carbide containers	6.00
Water tubes	.75
Valves, Complete	2.00
Valve stems only	1.00
Bail and hook	3.50
Hooks, for bail	1.20
Slide tube and disc (float feed)	3.00
Coil Spring used in place of disc and tube	2.50

JUSTRITE CARBIDE MINERS' LAMPS

CAP LAMPS

Lever Feed

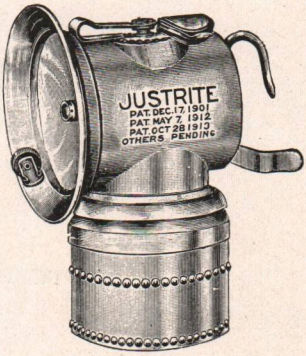
Concaved
2¼ In. Reflector



No. 4388A

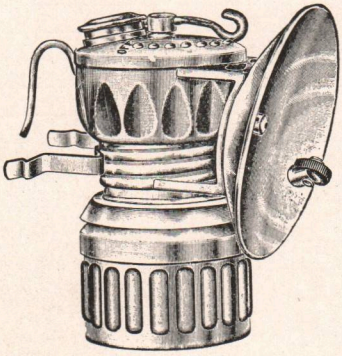
Description.
Drawn from seamless brass. Attached parts are riveted and soldered inside. Reflector is part of the lamp, cannot get loose or be broken off. **Equipped with lighter attachment. Matches not required.** ..Weight, 5 ounces... 16.7 candle-power. Charge, 2 ounces ¼-inch carbide.

Concaved
2⅝ In. Reflector

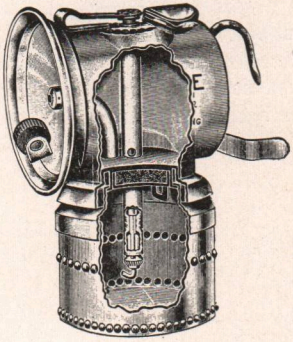


No. 4388B

	Price		Price
		Carbide Can	
Type 407 Lamp Only	$	Type 427 Lamp Only	$
Type 85 With No. 77		Type 258 With No. 77	



No. 4388D



No. 4388E

X-RAY LAMPS
Adjustable Reflector
2⅝ In. Reflector

	Price
Type 187 Lamp Only	$
3 In. Reflector	
Type 267 Lamy Only	

DUPLEX FEED
With "Jiffy" Bottom
2¼-in. Reflector

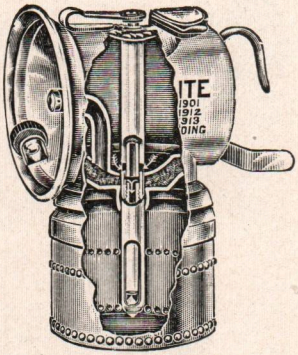
	Price
Type 227 Lamp Only	$
3 In. Reflector	
Type 287 Lamp Only	

For List of Repair Parts see pages 392 and 393.

Prices on Application.

JUSTRITE CARBIDE MINERS' LAMPS
NEW "LIBERTY" VALVE CAP LAMPS

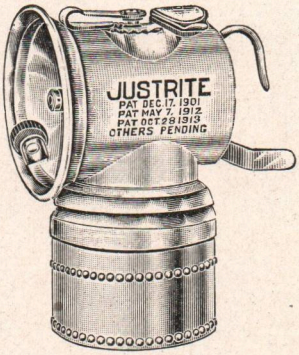
Concaved Reflector
2¼-in. Diameter



No. 4389A

Type			Price
4389A	807	Polished Brass, Lamp Only	$1.00
4389B	804	Polished Brass, with No. 77 Carbide Can	1.00

Saucer Shape Reflector
3-in. Diameter



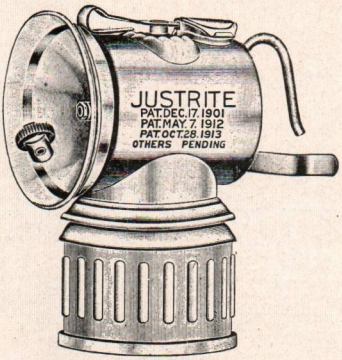
No. 4389C

Type			Price
4389C	867	Polished Brass, Lamp Only	$1.00

The LIBERTY VALVE is designed to give a liberal flow of water. It is different from any other carbide lamp valve, because the water flows through the inside of the valve stem, instead of around a restricting wire or rod. This is a new idea never before used in a carbide lamp. No wire or rod is used in the Liberty Valve Water Tube, to interfere with the flow of water to the carbide. The advantage of this new feature is immediately appreciated by the miner.

"LIBERTY' VALVE FEED WITH REINFORCED BOTTOM

Concaved 2¼-in. Reflector



No. 4389D

Type			Price
4389D	907	Polished Brass, Lamp Only	$1.25

Description

New Justrite Reinforced Bottom

The seam at base of bottom has five layers of metal rolled together. Solder is then forced into the crevices from the inside forming a solid rim ⅛-inch thick. The upper part, including the screw threads with rolled edge, is one piece drawn from seamless brass. The strongest and most durable carbide lamp bottom made. Adds strength just where it is most needed.

4350E 3-inch Saucer Shape Reflector.

Polished Brass. Type 967.
Lamp Only $1.25

For list of repair parts, see pages 392 and 393.

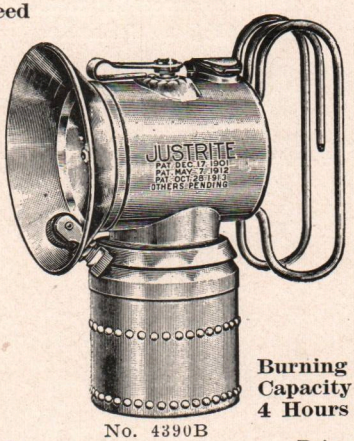
JUSTRITE CARBIDE LAMPS

SUPERINTENDENTS' LAMPS

"Liberty" Valve Feed

Nickel Plated

Equipped With Lighter Attachment



Burning Capacity 3 Hours

No. 4390A

Burning Capacity 4 Hours

No. 4390B

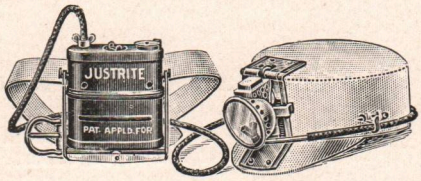
Type			Price	Type			Price
4390A	100	With Carbide Can	$1.50	4390B	95	With Carbide Can	$2.00

REPAIR PARTS, TYPE 4390C

Type		Price	Type		Price
31	Extra Bottoms for No. 100	$0.25	64	Felt Holders	$0.05
34	Extra Bottoms for No. 95	.30	800	Valve Stem for No. 100	.25
60	Rubber Gasket	.03	810	Valve Stem for No. 95	.25
62	Felt Packing	.03	172	Extra Flints for Lighter	.05

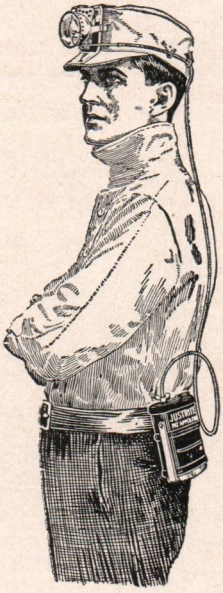
JUSTRITE HEAD LIGHT

For Drivers, Motormen, Miners, Inspectors, etc. Gives a penetrating light. Protected by strong lens. Will not blow out. Self-lighting attachment. Matches not required. Burns ten hours on one charge 8 oz. ½-inch carbide. Strong, Durable, compact. An ideal lamp for hunting, boating and driving.



No. 4390D

4390A Complete (Cap not included). Type 44 ..... $4.50



No. 4390E

REPAIR PARTS, NO. 4390E

Type		Price
40C	Carbide Container	$0.75
40W	Water Tank	1.00
40L	Head Lamp	1.25
41	Belt	.35
42	Hose, 4 feet	.50
42B	Pins (per pair)	.05
43	Rubber Gasket	.10
45	Burner Tip	.10
45B	Brass Tube and Tip	.35
46	Valve Stem	.25
47	Locking Clamp	.35
48	Regular Lens	.25
49	Special Lens	.50

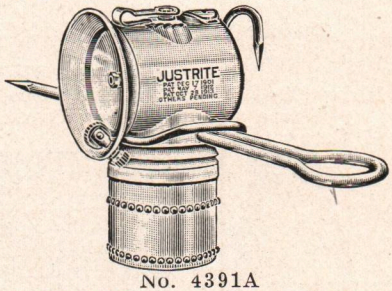
JUSTRITE CARBIDE MINERS' LAMPS

FOR METAL MINERS

HALF-SHIFT LAMP

With adjustable candlestick and steel hook. Concaved permanent reflector, 2 5/8-inch diameter. Lighter attachment.

DESCRIPTION—Drawn from seamless brass. Attached parts are riveted and soldered inside. Deep concaved reflector is part of the lamp; cannot get loose or be broken off. Equipped with No. 28 Jewel Tip. Height of lamp, 4 1/2 inches; weight, 9 ounces; diameter bottom, 2 inches; candle power, 18.



No. 4391A
Polished Brass. Lever Feed.
Burning Capacity, 4 1/2 Hours.

4391A	Type 101	Lamp only	26 gauge brass	.....
4391B	Type 108	With Carbide Can	26 gauge brass	.....
4391C	Type 103	Lamp only (heavier)	22 gauge brass	.....

4391G

REPAIR PARTS

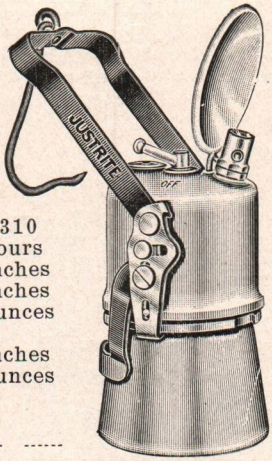
Type		Price Each	Type		Price Each
35	Candlestick	$0.25	64	Felt Holder	$0.05
69	Extra Bottom for No. 101	.25	79	Valve Stem	.25
29	Extra Bottom for No. 103	.35	17	Wire for Valve Stem	.03
60	Rubber Gasket	.03	28	Lava Burner Tip	.05
62	Felt Packing	.03	172	Extra Flints for Lighter	.05

THE "UNCLE SAM"

Seamless aluminum. Removable spiral valve stem.

DESCRIPTION—Strong and substantial to stand hard usage and knocks, yet light—the shell is 1/8-inch aluminum. Steel bail, hook and toggle lock. Simple, nothing to clog or get out of order. Has the new spiral valve stem water feed that feeds the water evenly and steadily, unaffected by shaking or jarring, and uses up every bit of the carbide. No. 324 Umbrella attachment for wet mines.

	No. 306	No. 308	No. 310
Capacity	6 hours	8 hours	10 hours
Height of Lamp	5 1/2 inches	6 inches	6 1/2 inches
Diameter Bottom	3 1/8 inches	3 3/4 inches	4 inches
Weight	31 ounces	38 ounces	42 ounces
Candle Power	18	20	20
Diameter Reflector	3 inches	4 inches	4 inches
Charge (1/4-in. carbide)	6 ounces	8 ounces	10 ounces



No. 4391D

PRICES

	Type			
4391D	306	With Reflector	6 hour capacity	.....
4391E	308	With Reflector	8 hour capacity	.....
4391F	310	With Reflector	10 hour capacity	.....

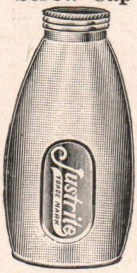
Prices for above on apprication.

For Repair Parts, see Pages 392 and 393.

ACCESSORIES AND REPAIR PARTS
FOR JUSTRITE CARBIDE LAMPS

Carbide Flask

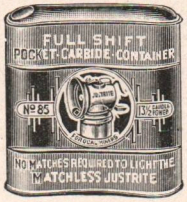
Heavy Tin, Oval Shape Screw Cap



No. 4392A

4392A 1-lb. Capacity. Type 23 ..... 25c

Pocket Carbide Can Concaved, Made in Two Sizes Sliding Cover



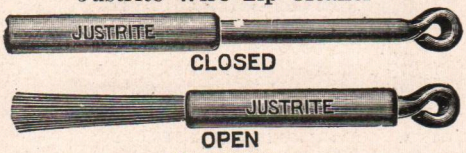
No. 4392B

4392B Type 76 ..... 15c

4392C 7-oz. Capacity. Type 77 ..... 15c

10-oz. Capacity ..... ??

Justrite Wire Tip Cleaner

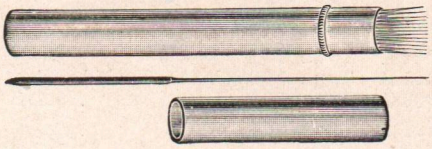


No. 4392G

50 Hard Rust-Proof Steel Wires—Sliding Cover Protects Wires When Not in Use

Type 37 Price.....10c

Tip Reamers



No. 4292H

		Each
Type 145	Reamers	5c
Type 150	Metal Tubes	5c

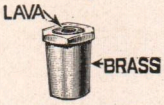
The Jewel Metal Tip

Lava Tips

No. 4392D

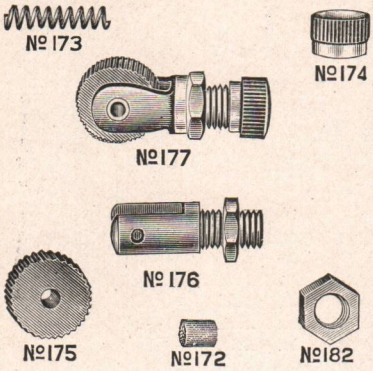
Type 66 With Air Holes 3c each

The Jewel Metal Tip



No. 4392E

Type 28 5c each



No. 4392F

Parts for Lighter

4392F

Type		Each
172	Flints	$0.05
173	Springs	.03
174	Caps	.05
175	Wheels	.05
176	Fork and Nut	.05
17	Lighter Complete	.10
182	Hexagon Nuts	.02

(Continued)

REPAIR PARTS FOR JUSTRITE CARBIDE LAMPS

Repair Part Outfits

No. 3

No. 4393A

Contents No. 3

4393A

100	No.	60	Gaskets
100	No.	62	Felts
12	No.	64	Felt Holders
144	No.	66	Tips
100	No.	28	Tips
24	No.	22	Tip Cleaners
48	No.	37	Tip Cleaners
72	No.	16	Wires
9	No.	78	Valve Stems
36	No.	145	Reamers
12	No.	177	Lighters
24	No.	172	Flints
12	No.	173	Springs
12	No.	174	Screw Caps
12	No.	176	Forks and Nuts
12	No.	181	Water Caps
12	No.	182	Hexagon Nuts
4	No.	113	Valve Stems

4393A Handsome Metal Show Case with Glass Cover—Sliding Drawer Opening from Back. White Enamel Finish. Price.....$17.50

Repair Parts for Cap Lamps

4393B

Type		Price
68	Extra Bottom Polished Brass	$0.20
60	Rubber Gasket	.03
62	Felt Packing	.03
64	Felt Holder	.05
78	Valve Stem for Lever Feed	.25
16	Wires for No. 78 Valve Stem	.03
800	Valve Stem for Liberty Feed	.25

For X-Ray Lamps

4393C

Type		Price
179	Extra Bottom, Brass	$0.20
190	Brace for Reflector	.15
200	2⅝″ Reflector, with Sparker	.20
201	3″ Reflector, with Sparker	.25
64	Felt Holder	.05
62	Felt	.03
60	Rubber Gasket	.03

For Duplex-Jiffy Lamps

4393D

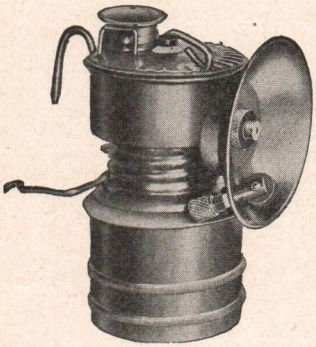
Type		Price
218	Extra Bottom Polished Brass	$0.15
60	Rubber Gasket	.03
217	Felt Packing	.03
216	Felt Holder	.05
220	Valve Stem	.25

Repair Parts for Uncle Sam Lamps

4393E

Type		Price Each
316	Gasket for No. 306 Lamp	$0.10
318	Gasket for No. 308 Lamp	.10
320	Gasket for No. 310 Lamp	.15
336	Screens for No. 306 Lamp	.20
338	Screens for No. 308 Lamp	.20
340	Screens for No. 310 Lamp	.25
334	Tip Protector for all Lamps	.25
344	Tip and Pillar for all Lamps	.25
354	Tip Only, for all Lamps	.10
324	Umbrella for all Lamps	.25
346	Valve Stem for No. 306 Lamp	.50
348	Valve Stem for No. 308 Lamp	$0.50
350	Valve Stem for No. 310 Lamp	.75
326	Reflectors for Nos. 306-308	.35
330	Reflectors for No. 310 Lamp	.50
376	Locking Clamp for No. 306 Lamp	.50
378	Locking Clamp for No. 308 Lamp	.50
380	Locking Clamp for No. 310 Lamp	.50
356	Water Cap and Spring	.25
366	Carbide Container for No. 306	1.75
368	Carbide Container for No. 308	1.75
370	Carbide Container for No. 310	2.00

LAMPS



No. 4394A

4394A **TYPE 22 S. L. LAMP.** With 2¾-inch polished brass reflector, fastened to lamp with locknut screwed on burner tube. Reflector strongly reinforced on back to protect from accidents. Intended for use in rooms or entries with high roofs. Brass lamp, in gun metal or bright finish. Price $1.00

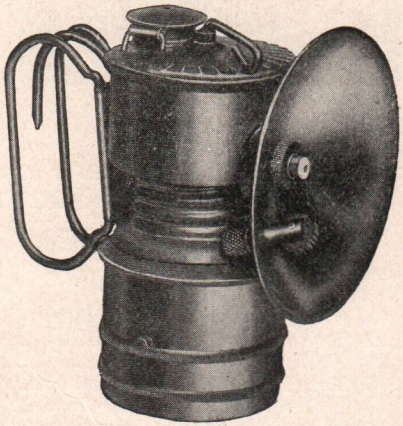
4394B **TYPE 22 LAMP.** Same as Type 22 S. L., without self-lighter added to reflector. Price..... 1.00

4394C **TYPE 220 S. L. LAMP.** Same as Type 22 S. L., nickel plated..... 1.25

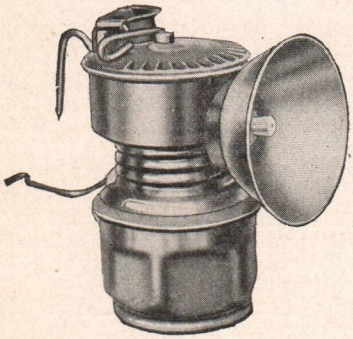
4394D **TYPE 23 LAMP.** Has a large, deep, 3-in. brass reflector, highly polished. Reflector fastened to lamp by locknut screwed to burner tube. Strongly braced on back of reflector to protect from injury. Brass lamp. Can be furnished in gun metal finish or bright brass. Price..... 1.00

4394E **TYPE 23 S. L. LAMP.** Same as Type 23, but with self-lighter added to reflector. Brass lamp. Price..... 1.10

4394F **TYPE 230 S. L. LAMP.** Same as Type 23 S. L., nickel plated. Price..... 1.40



No. 4394C



No. 4394G

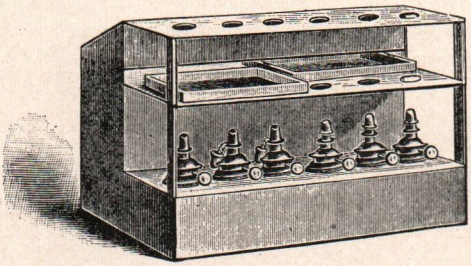
4394G **TYPE 24 S. L. LAMP.** Has a large 3-inch, extra deep, bell shaped reflector, highly polished. Reflector fastened to lamp by lock-nut screwed to burner tube. Strongly reinforced on back of reflector to protect from injury. Intended for motormen, drivers and men working in wet places. Brass lamp. Price..... 1.25

4394H **TYPE 24 LAMP.** Same as above, without self-lighter. Price..... 1.25

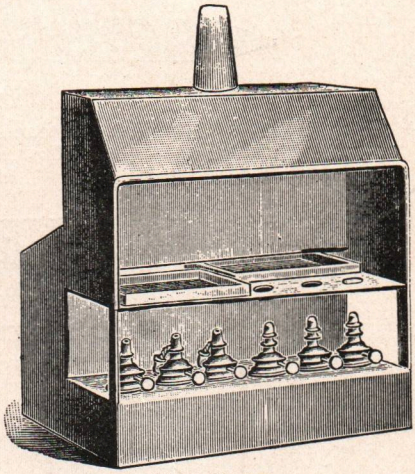
4394I **TYPE 26 S. L. LAMP.** Has a small, deep, 2½-inch bell shaped reflector, highly polished. Reflector fastened to lamp by lock-nut screwed to burner tube. strongly reinforced on back of reflector to protect from injury and to keep water from seeping through to burner. Intended for men working in low top wet places. Top of reflector on this lamp is on a level with top of water cap. Self-lighter attachment. Brass lamp only. Price..... 1.00

4394J **TYPE 26 LAMP.** Same as above, without self-lighter. Price..... 1.00

LAMPS



No. 4395A



No. 4395B

4395A **LAMPS, PARTING.** By W. H. Leavens; for alcohol; galvanized iron, very strong; shelves for sand bath and annealing cups; upper shelf perforated for holding test tubes.

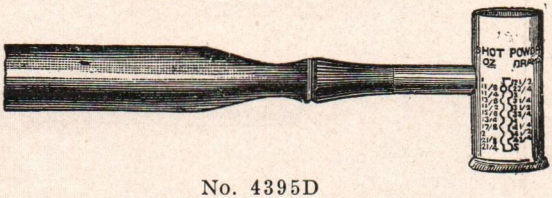
No. of burners	6	8	12
Each	$5.00	5.75	6.50

4395B **LAMPS, PARTING.** Same as above, except upper shelf is left out so as to use flasks instead of test tubes. Hood and pipe attached for carrying off fumes.

No. of burners	6	8	12
Each	$5.50	6.60	7.75

4395C **LAMP WICKS.** For parting lamps.....doz. $0.20

LEAD MEASURES



No. 4395D

4395D **LEAD MEASURES.** Of improved construction for test lead.....$0.40

LEAD FOIL. Chemically pure. See Chemical List.

LENSES. See Magnifiers.

MAGNETS AND MALLETS

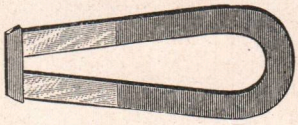
No. 4396A

4396A **LITMUS PENCILS.** Of chemically pure litmus, blue on one end and red on the other.....each $0.75

No. 4396B

4396B **MAGNETS, BAR, STRAIGHT.**

Size ..... inches	4	5	6	8	10
Each	$0.70	1.10	1.60	2.10	3.00

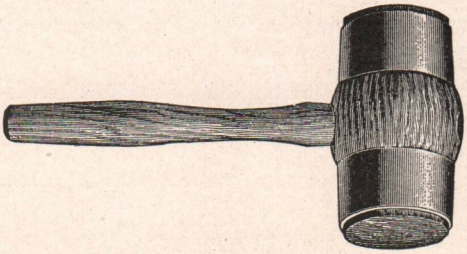


No. 4396C

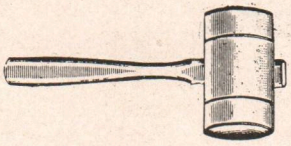
4396C **MAGNETS, HORSHOE.** Superior quality.

Size ..... inches	2	3	4	5	6	8	10	12
Each	$0.25	.55	.75	1.00	1.50	2.00	3.00	4.50

MAILING ENVELOPES. See Paper.



No. 4396D



No. 4396E

No. 4396F

4396D **MALLETS, FIBER ENDS.** Best quality.

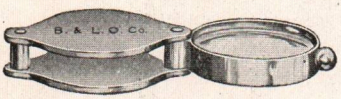
Diameter ..... inches	2	2½
Each	$1.50	2.00

4396E **MALLETS, HARDWOOD**.....each $1.00

4396F **MALLETS, RAWHIDE.** Best quality, 2⅜ inches diameter..each 3.00

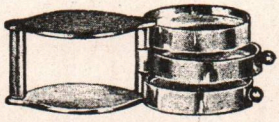
MAGNIFYING GLASSES

Vulcanite Mounting



No. 4397A

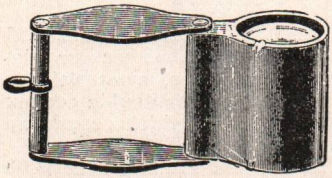
Nickeled Mounting



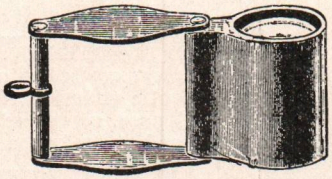
No. 4397B

These magnifying glasses are made in one, two or three lenses, which may be used singly or in combinations for different magnifications.

		1-Lens	2-Lens	3-Lens
4397A	**MAGNIFYING GLASSES.** Vulcanite Mounting, 1 inch diameter	$0.50	.85	1.25
4397B	**MAGNIFYING GLASSES.** Nickeled Metal Mounting, 1 inch diameter	$0.90	1.50	2.25



No. 4397C



No. 4397D

These are genuine Coddington Magnifiers, very powerful, in nickel-plated folding cases.

		20x	15x	10x	7x
4397C	**MAGNIFYING GLASSES, CODDINGTON.** Diameter	½ in.	¾ in.	1 in.	1½ in.
	Price	$3.50	3.50	2.50	2.00

" How to Read a Magnifier."

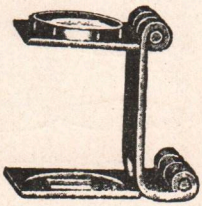
For satisfactory results magnifier shauld be held at about the distance from the eye a spectacle lens is ordinarily worn. If this rule is disregarded, the size of the visual field is limited and the marginal definition is likely to be indistinct.

4397D **MAGNIFIERS, GLOBE.** The Globe lens is a perfect sphere, consisting of a hollow flint glass globe, made in halves, and enclosing a solid crown glass globe. By the principles of its construction the aberrations are corrected to a higher degree than has heretofore been obtained by any other construction. This lens has an optical axis in any direction, hence the field is perfectly flat and distinct to the outer edge; and what is true of no other lens, the field is always the largest possible. Pocket magnifiers made on this principle are furnished as follows:

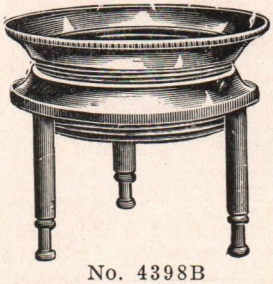
Type 290—1-nich focus, nickel-plated brass mount, magnifying 11 diameters	$ 4.00
Type 291—¾-inch focus, nickel-plated brass mount, magnifying 14 diameters	5.00
Type 292—½-inch focus, nckel-plated brass mount, magnifying 21 diameters	6.00

In ordering magnifiers, always specify diameter.

MAGNIFIERS



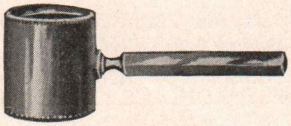
No. 4398A



No. 4398B

4398A **MAGNIFIER, THREAD COUNTER.** Especially for screen and linen counting is mounted at a distance above the base equal to its focal length, while an opening in the base exposes the object to be magnified. Both lens mount and base are hinged to fold up compactly when not in use. In ¼ or ½-inch size.
Price $0.75

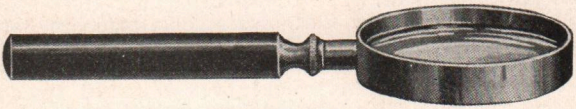
4398B **TRIPOD MAGNIFIER.** This Magnifier is of sufficient power for elementary biological work and because of its large, clear field is quite widely used for dissections. It consists of two double convex lenses, separated by a diaphragm, in a mounting which screws up and down in the brass frame for focusing.
Price $1.00



No. 4398C

4398C **MAGNIFIER, APLANTIC.** Giving a perfectly flat field of great brilliancy and definition.
Price $1.25

READING GLASSES



No. 4398D

Too much emphasis can scarcely be laid upon the quality of these reading glasses. They are unsurpassed, we believe, in optical properties, design and workmanship.

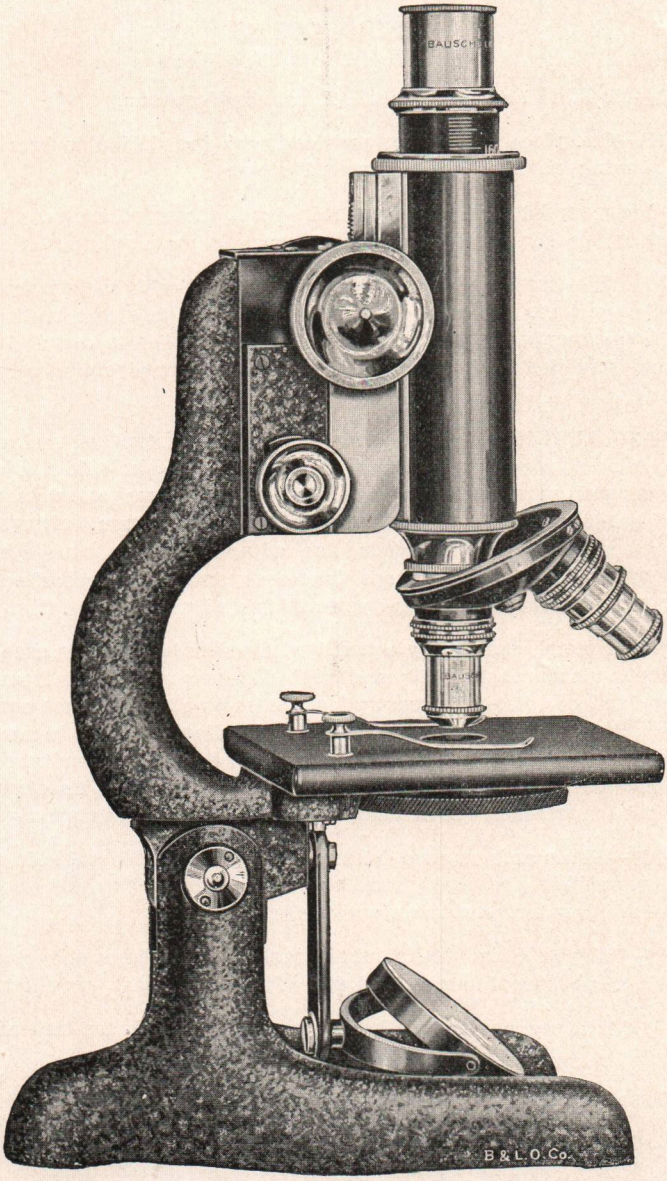
The lenses are accurately ground of clear, white optical glass and highly polished. While giving comparatively low magnifications, they cover a wide field. Rims are nickel-plated of sufficient width to protect the lens surfaces. The handles are of ebonized wood.

4398D

Diameter .....inches	2	2½	3	3½	4	4½	5	5½	6
Eq. Focal Length..inches	5	6	7	8	10	12	13	14	15

Prices on application.

MICROSCOPES



No. 4399A
Microscope FS 2
(.5 Actual Size)
For description, dimensions, prices, etc., see following page.

MICROSCOPES

BASE—Modified horseshoe form, of rounded contour.

PILLAR—One piece with base; provided with broad, double bearing inclination joint, having vertical and horizontal stops.

ARM—Long curved form with rounded edged, of rugged construction to withstand laboratory usage; provides maximum space for manipulation of object.

BODY TUBE—Outside diameter 35 mm; provided with society screw thread; standard size eyepieces are used draw tube guaduated in single millimeters with every tenth line numbered, adjustable in lined sleeve, or in metal fitting, if so specified, and provided with society screw thread for use of Zeiss apertometer objective, etc.

FOCUSING ADJUSTMENT—Coarse adjustment by standard rack and pinion, provided with stop to prevent pinion from overriding rack; side fine adjustment of lever type, with micrometer head on each side of arm; complete rotation of micrometer heads produces vertical movement of 0.25 mm, always in same direction as coarse adjustment heads, fine adjustment ceases to operate when objective touches slide; positive stops denote upper and lower limits; automatic take-up for wear is provided, and all parts of fine adjustment are dust-proof.

STAGE—Of metal, completely covered with vulcanized rubber except at point of attachment; measures 102x102 mm, with distance of 76 mm from center to arm at stage surface (distance from optical center to extreme inner curve of arm, 85 mm); provided with spring clips and an iris diaphragm with mount having screw threads for attaching a substage ring to hold an Abbe condenser; iris diaphragm controlled by milled ring, operated from any point of its circumference; stage attached to arm on broad bearing surface to insure maximum rigidity.

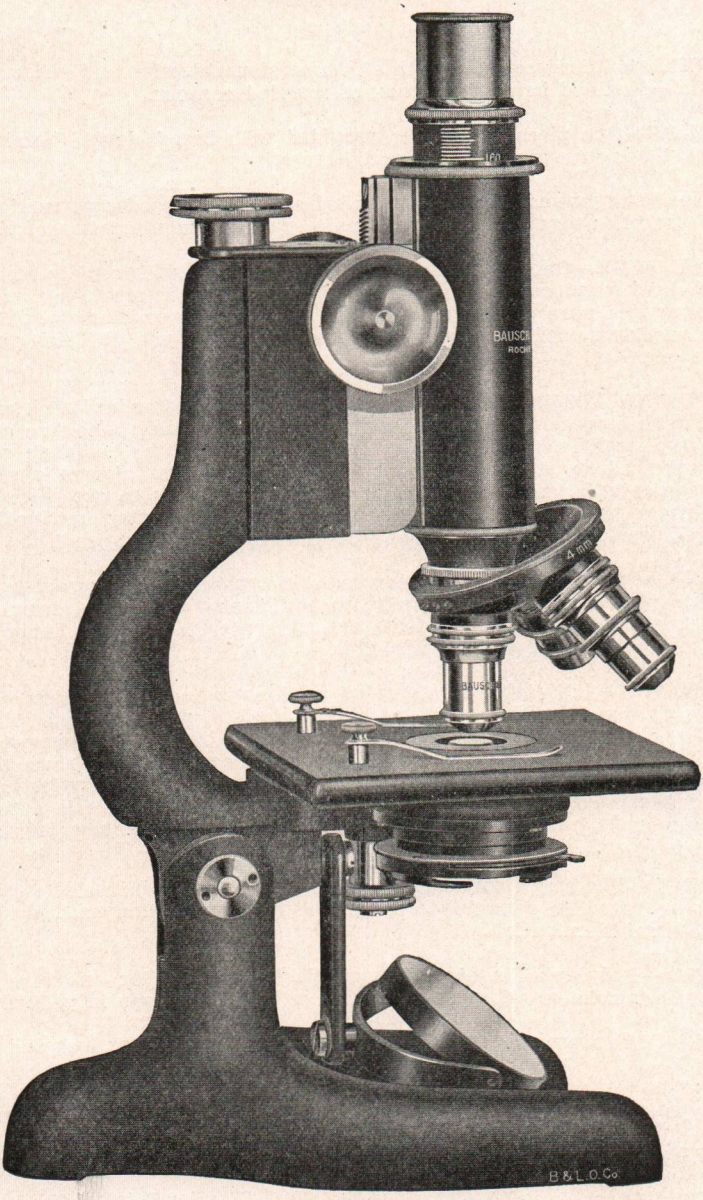
MIRROR—Plane and concave, 50 mm in diameter; adjustable in two planes in a fork, mounted on a swinging arm for oblique illumination and provided with stop for central illumination; mirror not easily removable.

FINISH—Body tube in alcohol-proof black; base, pilliar and arm in black crystal finish, alcohol-proof; pinion and fine adjustment heads in yellow.

CASE—Of hard wood with polished finish; fitted with brass lock and key.

	Type No.	Objectives—Dry		Eyepieces		Nosepieces	Price
4400A	FS 1	16 mm	4 mm	7.5×			$48.00
4400B	FS 2	16 mm	4 mm	7.5×		Circular Double	53.25
4400C	FS 3	16 mm	4 mm	5×	10×		50.00
4400D	FS 4	16 mm	4 mm	5×	10×	Circular Double	55.25
4400E	FS 6	16 mm	4 mm	5×	10×	Circular Double Abbel Condenser	66.25

MICROSCOPES



No. 4401A
Microscope FF
(.5 Actual Size.)
For description, dimensions, prices, etc., see following page.

MICROSCOPES

TYPE

Microscope FFS

(This is Microscope FS with oil immersion objective and substage)

BASE—Modified horse-shoe form, of rounded contour.

PILLAR—One piece with base; provided with broad, double bearing inclination joint, having vertical and horizontal stops.

ARM—Long curved form with rounded edges, of rugged construction to withstand laboratory usage; provides maximum space for manipulation of object.

BODY TUBE—Outside diameter, 35 mm; provided with society screw thread, standard sized eyepieces are used draw tube graduated in single millimeters with every tenth line numbered, adjustable in lined sleeve, or in metal fitting, if so specified, and provided with society screw thread for use of Zeiss apertometer objective, etc.

FOCUSING ADJUSTMENT—Coarse adjustment by standard rack and pinion, provided with stop to prevent pinion from overriding rack; side fine adjustment of lever type, with micrometer head on each side of arm; complete rotation of micrometer heads produces vertical movement of 0.25 mm, always in same direction as coarse adjustment heads; fine adjustment ceases to act when objective touches slide; positive stops denote upper and lower limits; automatic take-up for wear is provided, and all parts of fine adjustment are dust-proof.

STAGE—Of metal, completely covered with vulcanized rubber except at point of attachment; measures 102x102 mm, with distance of 76 mm from center to arm at stage surface (distance from optical center to extreme inner curve of arm, 85 mm); provided with spring clips.

SUBSTAGE—Adjustable for focus by quick acting screw; consists of tube for condenser and an iris diaphragm, which comes into plane of stage when screw is turned up as far as possible, allowing condenser to be used in immersion contact with slide; condenser is provided with iris diaphragm beneath, thus giving two iris diaphragms with equipment; substage is swung to left of optical axis when screw reaches limit of motion downward; upper iris diaphragm is automatically locked against closing with condenser in position, or against inserting condenser when iris is closed.

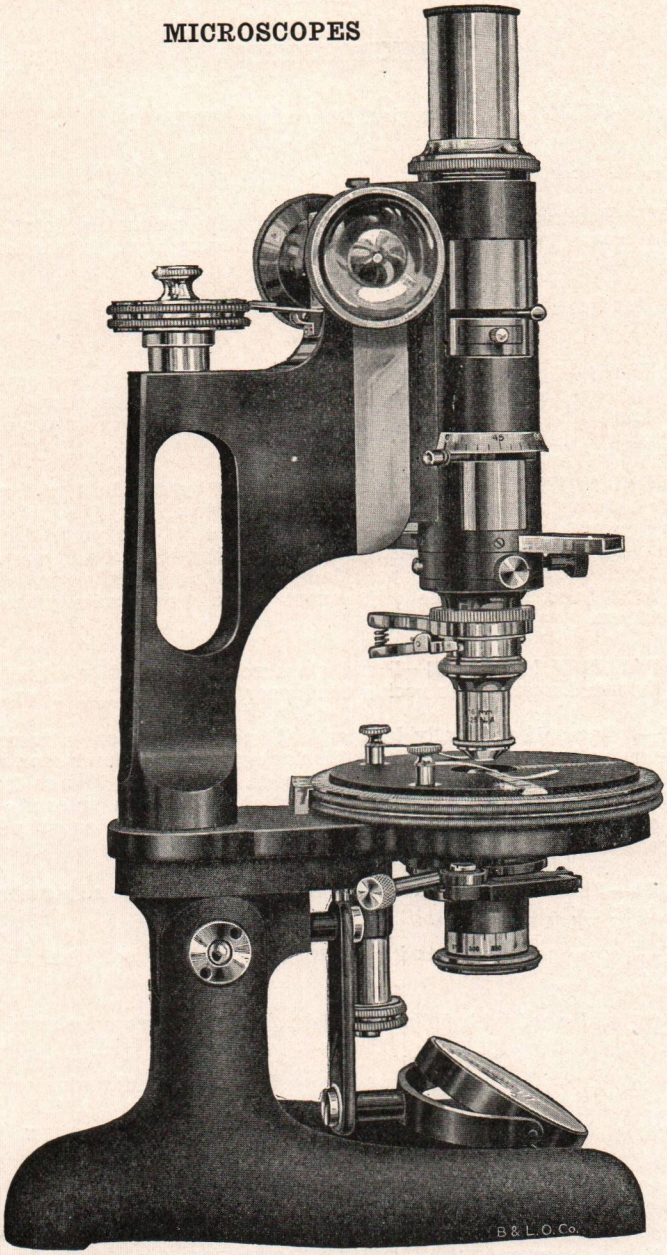
MIRROR—Plane and concave, 50 mm in diameter; adjustable in two planes in a fork, mounted on swinging arm for oblipue illumination and provided with stop for central illumination.

FINISH—Body tube in alcohol-proof black; base, pillar and arm in black crystal finish, alcohol-proof; pinoin and fine adjustment heads in yellow.

CASE—Of hard wood with polished finish; fitted with brass lock and key.

Type	Objectives Dry	Objectives Oil Immersion	Eyepieces	Nosepieces	Abbe Condenser	Price
4402A FFS	6 16mm	4mm	5× 10×	Circular Double	1.20 N.A	$ 72.75
4402B FFS	8 16mm	4mm { 1.9 mm 1.30 N.A. }	5× 10×	Circular Triple	1.20 N.A.	110.00
4402C FFS	10 16mm	4mm { 1.9 mm* 1.32 N.A. }	5× 10×	Circular Triple	1.20 N.A.	140.00

MICROSCOPES



No. 4403A

Metallurgical Microscope CCM

For description, dimensions, prices, etc., see following page.

MICROSCOPES

Metallurgical Microscope CCM*

BASE—Horse-shoe form.

PILLAR—Rectangular in section; provided with inclination joint and clamping lever to secure instrument in any position, having stops in vertical and horizontal positions.

ARM—Handle type of enlarged design, providing ample space for manipulation of object.

BODY TUBE—Outside diameter 39 mm; provided with society screw thread; standard sized eyepieces are used; draw tube graduated in single millimeters with every tenth line numbered, adjustable in lined sleeve, or in metal fitting, if so specified.

FOCUSING ADJUSTMENT—Coarse adjustment by standard rack and pinion, provided with stop to prevent pinion from overriding rack; fine adjustment of our lever type with milled micrometer screw head in two parts for slow and rapid movement, the larger groduated into 100 divisions, each equal to .0025 mm in vertical movement, and provided with hinged indicator, which may be turned back from head; fine adjustment ceases to operate when objective touches specimen.

VERTICAL ILLUMINATOR—Plane glass reflector, readily adjustable; provided with threaded aperture to recive condenser tube when this is ordered.

STAGE—Adjustable vertically by standard rack and pinion to increase working distance and allow focusing without displacing vertical illuminator with reference to light; circular, 78 mm in diameter, with distance of 70 mm from center to base of arm; aperture 40 mm in diameter; of metal with vulcanite top; provided with centering screws and spring clips; removable for substitution of attachable mechanical stage.

MIRROR—Plane and concave, 50 mm in diameter; adjustable in two planes in a fork mounting.

FINISH—Lower parts, arm and body tube in alcohol-proof black, other parts in yellow.

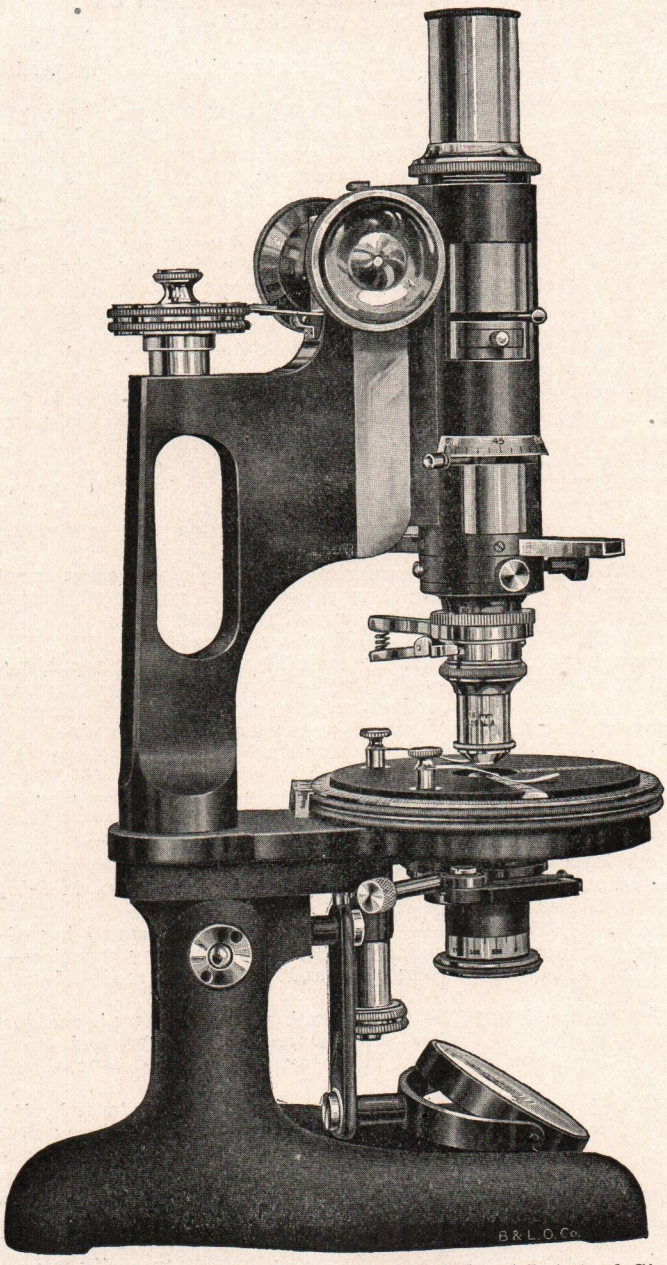
CASE—Of hard wood with polished finish; fitted with brass lock and key.

	Type	Objectives Dry	Eyepieces	Vertical Illuminator	Price
4404A	CCM 1	16mm 4mm	5×	No. 1785	$138.00
4404B	CCM 3	16mm 4mm	5× 10×	No. 1785	139.75
4404C	CCM 5	32mm 16mm 4mm	5× 10×	No. 1785	144.50
4404D	2118	Attachable Mechanical Stage for CCM			30.00

Objectives included in above outfits are in regular size mounts, except the 32 mm, which is in short mount. If other objectives are desired in short mounts, add $1.00 for each objective to above prices. The 4 mm objective is specially corrected for uncovered objects.

*After the design of Dr. Albert Sauveur, Harvard University.

MICROSCOPES



No. 4405A **Petrographical Microscope LCH** (.5 Actual Size)
For description, dimensions, prices ,etc., see following page.

PETROGRAPHICAL MICROSCOPE LCH*

(Laboratory Model)

BASE—Horse-shoe form.

PILLAR—Round; provided with inclination joint, having vertical and horizontal stops.

ARM—Handle type; providing vertical distance from stage to arm of 60 mm; horizontal distance from center of stage to base of arm, 75 mm.

BODY TUBE—Outside diameter, 35 mm; draw tube, sliding in metal fitting, graduated in single millimeters and numbered 160, 170 and 180, having slot for Bertrand lens with iris diaphragm above it; takes standard size eyepieces, which are supplied here with cross-hairs and the eye-lens adjustable for focusing upon them; has two notches in upper edge for fixing azimuth of eyepiece; analyzer box slides in and out of body tube; slot in body tube with dust-proof shutter placed just beneath analyzer for accessories; nosepiece with society screw thread, non-detachable, centering by means of two screws working at right angles in N and E positions.

FOCUSING ADJUSTMENT—Coarse adjustment by standard rack and pinion with stop to prevent pinion overriding rack; fine adjustment of our lever type with micrometer screw-head graduated in 100 parts, each equal to .0025 mm in vertical movement, and provided with hinged vernier for reading to .0005 mm; ceases to act when objective touches specimen.

STAGE—Revolvable; circumference graduated in single degrees with each tenth line numbered, the double vernier reading to one-tenth degree in both directions; diameter of stage outside of graduations 112 mm, inside 95 mm; stage plate, vulcanite-covered, having inlaid for orientation two millimeter scales at right angles, 30 mm long, with each tenth line numbered.

SUBSTAGE—Adjustable by long range quick acting screw, turning to left completely clear of optical axis when screw reaches limit of downward movement; carries condensers, iris diaphragm and polarizer.

ILLUMINATING APPARATUS—Three-lens condenser, 1.10 N. A.; upper lenses in swinging arm operated by milled head at side, providing for quick change from convergent to parrallel light without disturbing any other substage part; iris diaphragm below condenser, mirror plane and concave, 50 mm in diameter, mounted on swinging arm with stop for central illumination.

POLARIZER—A Nicol prism (angular field 19") in revolving mount graduated in 15-degree parts, each alternate line numbered—0, 30, 60, 90 and so on up to 330; entire mounting with prism removable from optical axis by double-swing movement to one side.

ANALYZER—A Thompson prism, revolvable a quarter turn, in sliding prism box which carries graduations and indicator allowing withdrawal and return to optical axis without disturbing reading on scale; graduations in 5-degree parts, numbered 0, 30, 60 and 90

CHANGING NOSEPIECE—As shown in illustration, consisting of two parts, the upper one with clamp permanently attached to centering nosepiece—the lower, a ring threaded to take objective; ring and socket are made of steel for long service.

ACCESSORIES INCLUDED—One selentine plate, mounted, one quartz wedge, mounted one Quarter Undulation plate, mounted, and Bertrand lens, mounted; pinhole cap fitting draw tube for observing interference figures after Lasaulx method.

FINISH—Main parts in alcohol-proof black; pinion heads and adjacent parts in yellow; adjusting heads nickel-plated; all groduations in Liberty silver.

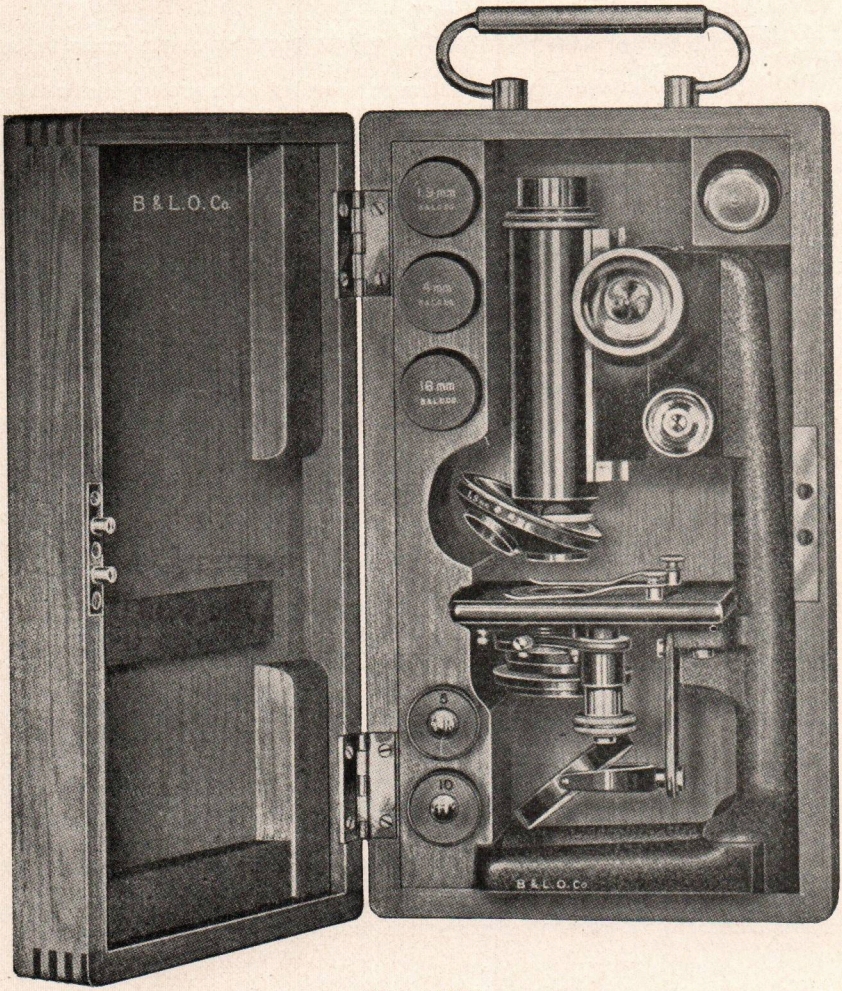
CASE—Of hard wood with polished finish, fitted with brass lock and key.

	Type No.	Objectives	Cross Hair Eyepieces	Quick Changing Nosepiece
4406A	LCH 2	16mm, 4mm,	7.5×10×	With two rings
4406B	LCH 4	32mm, 16mm, 4mm	7.5×10×12.5×	With three rings

*After design of Dr. F. E. Wright, Carnegie Institution of Washington, D. C.

Prices on application.

MICROSCOPES



No. 4407A

Portable Microscope APS 8

(.3 Actual Size)

For general description, prices, etc., see following page.

MICROSCOPES

Portable Microscopes APS

BASE—Folding, with each arm turning on its own center.

PILLAR—Rounded, of one piece with arm.

ARM—New handle type, with rounded edges; provides ample space for manipulation of object.

BODY TUBE—Outside diameter, 35 mm; provided with society screw thread; standard sized eyepieces are used; draw tube graduated in single millimeters with every tenth line numbered, adjustable in lined sleeve, or in metal fitting, if so specified.

FOCUSING ADJUSTMENT—Coarse adjustment by standard rack and pinoin, provided with stop to prevent pinion from overriding rack; side fine adjustment of lever type, with micrometer head on each side of arm; complete rotation of micrometer heads produces vertical movement of 0.25 mm, always in same direction as coarse adjustment heads; fine adjustment ceases to act when objective touches slide; positive stops denote upper and lower limits; automatic take-up for wear is provided, and all parts of fine adjustment are dust-proof.

STAGE—Of metal, completely covered with vulcanized rubber except at point of attachment; measures 92x76 mm, with distance of 62 mm from center to base of arm; provided with spring clips.

SUBSTAGE—Adjustable by quick acting screw; carries Abbe condenser and two iris diaphragms.

MIRROR—Plane and concave, 50 mm in diameter; adjustable in two planes in a fork, mounted on swinging arm for oblique illumination.

FINISH—Body tube, with connections, draw tube and substage in alcohol-proof black; base, pillar and arm in black crystal finish, alcohol-proof; pinion and fine adjustment heads in yellow.

CASE—Of hard wood with polished finish; fitted with brass lock and key; dimensions, 292x162x114 mm (11½x6⅜x4½ in.).

WEIGHT—APS in carrying case, 9 lbs., 4 ozs.

Type	Objectives Dry	Objectives Oil Imsn.	Eyepcs.	Nosepieces	Abbe Condenser	Price
4408A APS 8	16mm 4mm	1.9 mm / 1.50 N.A.	5× 10×	Circular Triple	1.20 N.A.	$115.00
4408B APS 10	16mm 4mm	1.9 mm* / 1.32 N.A.	5× 10×	Circular Triple	1.20 N.A.	145.00

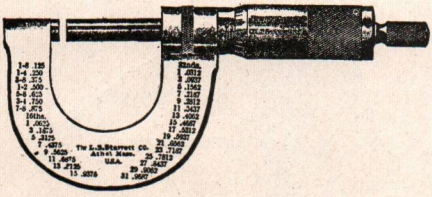
If substage equipped with Swing-Out Condenser is desired, add $5.00. When ordering, add "Swing" to order.

We can also supply Portable Microscope APS without the screw substage and with less extensive optical equipments at the following prices:

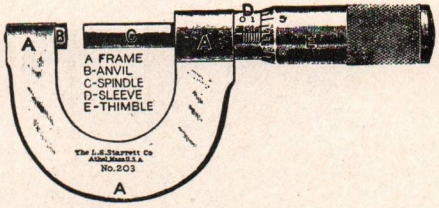
	Type	Objectives Dry		Eyepieces	Nosepieces	Price
4408C	APS 1	16mm	4mm	7.5×		$53.00
4408D	APS 2	16mm	4mm	7.5×	Circular Double	58.25
4408E	APS 3	16mm	4mm	5× 10×	Circular Double	55.00
4408F	APS 4	16mm	4mm	5× 10×	Circular Double	60.25

Microscope APS 1-2-3-4 will be furnished with a substage ring and Abbe condenser, 1.20 N. A., at an additional cost. Price on request. When ordering, add "Condenser" to order.

MICROMETERS



4409A



4409B

4409A **MICROMETERS.** For measurement by thousandths up to 1 inch

Has locknut and ratchet stop.....$12.00

In leather case 13.00

HOW TO READ A MICROMETER

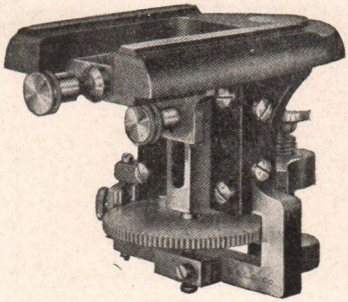
4409B The spindle C is attached to the thimble E at the point H. The part of the spindle which is concealed within the sleeve and thimble is threaded to fit a nut in the frame A. The frame being held stationary, the thimble E is revolved by the thumb and finger, and the spindle C being attached to the thimble revolves with it, and moves thru the nut in the frame, approaching from the anvil B. The article to be measured is placed between the anvil B and the spindle C. The measurement of the opening between the anvil and the spindle is shown by the lines and figures on the sleeve D and the thimble E.

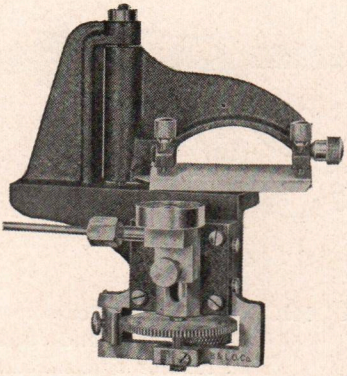
The pitch of the screw threads on the concealed part of the spindle is 40 to an inch. One complete revolution of the spindle therefore moves it longitudinally one fortieth (or twenty-five thousandths) of an inch. The sleeve D is marked with 40 lines to the inch, corresponding to the number of threads on the spindle. When the micrometer is closed, the beveled edge of the thimble coincides with the line marked 0 on the sleeve, and the 0 line on the thimble agrees with the horizontal line on the sleeve. Open the micrometer by revolving the thimble one full revolution, or until the 0 line on the thimble again coincides with the horizontal line on the sleeve; the distance between the anvil B and the spindle C is then 1/40 or (.025) of an inch, and the beveled edge of the thimble will coincide with the second vertical line on the sleeve. Each vertical line on the sleeve indicates a distance of 1/40 of an inch. Every fourth line is made longer than the others, and is numbered 0, 1, 2, 3, etc. Each numbered line indicates a distance of four times 1/40 of an inch, or one tenth.

The beveled edge of the thimble is marked in twenty-five divisions, and every fifth line is numbered from 0 to 25. Rotating the thimble from one of these marks to the next moves the spindle longitudinally 1/25 of twenty-five thousandths, or one thousandth of an inch. Rotating it two divisions indicates two thousandths, etc. Twenty-five divisions will indicate a complete revolution, .025 or 1/40 of an inch.

To read the micrometer, therefore, multiply the number of vertical divisions visible on the sleeve by 25, and add the number of divisions on the bevel of the thimble, from 0 to the line which coincides with the horizontal line on the sleeve. For example, as the tool is represented in the engraving, there are seven divisions visible on the sleeve. Multiply this number by 25, and add the number of divisions shown on the bevel of the thimble, 3. The micrometer is open one hundred and seventy-eight thousandths. ($7 \times 25 = 175 + 3 = 178$.)

MICROTOMES





CLINICAL MICROTOME

The **CLINICAL MICROTOME** is an instrument of unusual simplicity, designed for the rapid but accurate cutting of frozen sections, also for the sectioning of objects embedded in paraffin or celloidin. Because of its durability and accuracy, it commends itself particularly for convenient, all-round serviceability.

The object clamp is o fone piece, extremely rigid; when fully extended, it takes objects 30x22 mm. The object clamp interchanges readily with the freezing chamber, since both are attached in the same way. This attachment is by our standard V-bearing block with T-slot of sufficient length to permit objects of different thicknesses to be adjusted with relation to the knife.

Full descriptive circular on request.

4410A **CLINICAL MICROTOME** with object clamp (no knife). Type 3054 ..... $25.00

4410B **CLINICAL MICROTOME,** with freezing attachment complete with regulating valve in place of object clamp (no knife). Type 3056 ..... 31.00

4410C **PLAIN MICROTOME KNIFE,** as described; 90 mm blade with 82mm cutting edge; without handle. Type 3092 ..... 7.00

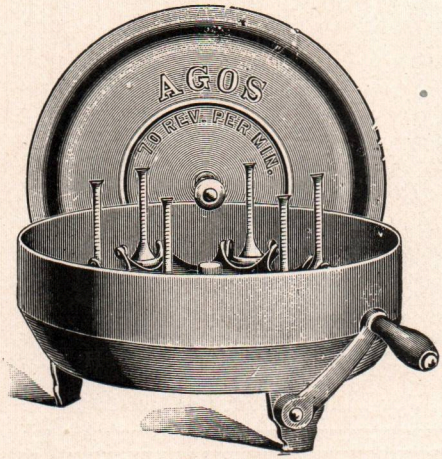
4410D **20 LB. CYLINDER OF CO_2,** with wall straps and wrench. Type 3076 ..... 32.00

TABLE MICROTOME. This model attaches securely to a table edge, or similar support, and is adapted to all kinds of sectioning for thicknesses of 5 microns and over. It is used largely in work preliminary to surgical operations and by students in ordinary laboratory courses.

4410E **TABLE MICROTOME,** as described, without knife. Type 3050..$18.00

MILK TESTING APPARATUS

THE "AGOS" CAST IRON FRAME HAND BABCOCK TESTER



No. 4411A

4441A The "Agos" Hand Babcock Tester is a perfect hand tester. It has cast iron body and cover with machine cut spur and spiral gearing teeth. The bottle head is of malleable iron; seamless brass swinging pockets, and strong rings allow the bottles to swing perfectly horizontal when in motion. Ball bearings make it turn easier and run more smoothly and quietly than others.

The Hand "Agos" is similar to the Steam Turbine "Agos" which is so popular among its many users, and is used to give satisfaction to all those who desire a perfectly accurate, efficient, simple, durable hand tester.

The gearing is so arranged that a very high speed is obtained easily, which is one of the most important requisites of a tester.

The "Agos" Tester takes up little room and uses either the ordinary Babcock bottle the "Wagner" or the Ohlsson" Patent Bottles.

They are made in five sizes as follos:

4 bottles	$16.00	10 bottles	$20.00
6 bottles	17.00	12 bottles	21.00
8 bottles	19.00	Shipping weight, about 85 lbs.	

With each tester is furnished the following outfit, viz:—

Full set of regular Babcock milk bottles, pipette, acid measure, acid sufficient for making 50 to 100 tests, and directions for manipulating . All testers are fitted with the ordinary milk bottles unless different bottles are ordered.

THE ALKALINE TABLET TEST

4411B A simple and accurate method of determining the acidity of cream, milk, or buttermilk. Particularly is it adapted for testing the acidity or proper sourness of cream for churning.

Perfectly uniform results as to flavor and quality of butter can be obtained only with this system.

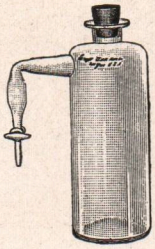
PRICE

Graduatel Cylinder, 100 c.c.	$0.75
Pipette, 17.6 c.c.	.25
Porcelain Cup	.25

MILK TESTING APPARATUS

No. 4412A

No. 4412D



No. 4412H

4412A **TEST BOTTLE, BABCOCK'S.** For milk. Graduated to 10% in 1/5 %. Type 8050 ..... each $0.35
Per dozen 1.00

4412B **TEST BOTTLE, BABCOCK'S.** For cream. Graduated to 30% in ½ %. Type 8060 ..... each .35
Per dozen 4.00

4412C **TEST BOTTLE, BABCOCK'S.** For cream. Graduated to 50% in 1 %. Type 8060 ..... each .35
Per dozen 4.00

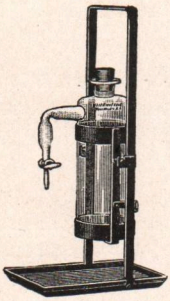
4412D **TEST BOTTLE.** For skim milk, with double bore. Type 8090.
Graduated in 1/20 % ..... each .75
Graduated in 1/100 % ..... each .75

4412E **FUNNELS.** For test bottles ..... each, net .30

4412F **ACID MEASURE, 17-5 cc.** Type 8195 ..... each .30

4412G **ACID PIPETTE, 17-5 cc.** Type 8165 ..... each .25

4412H **ACID BOTTLE.** With 17-5 cc. pipette and stopcock. A very simple and practical measure. Type 8205 ..... each 6.00



No. 4412I

4412I **ACID BOTTLE TILTER.** For acid bottles, with a lead-lined protecting base, as used by the Illinois State Food Laboratory. Very handy, rapid and convenient. With bottle ..... each $11.00

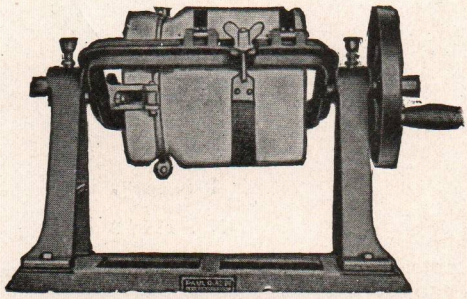
Without bottle ..... each 5.00

4412J **PIPETTES, AUTOMATIC.** To operate the Pipette squeeze rubber bulb, then insert point of Pipette in the milk, release bulb and the Pipette fills, the overflow going into the large glass bulb. To empty overflow remove stopper connection. With a little practice the overflow is very slight.
Type 8150 ..... each 2.50

MILLS AND MORTARS

BALL MILLS

(Laboratory Sizes.)



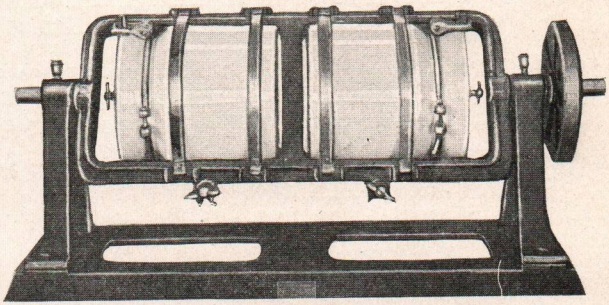
No. 4413A
Single

TROJAN MILLS

In presenting these Laboratory Mills, we desire to call special attention to the fact that the porcelain jars of these machines are "Imported," that they are manufactured from the finest raw materials obtainable, made in the plastic state, thus forming jars that are impervious to the actions of even such materials as ink. These jars are of so superior a quality that constant use of them has never worn them out.

4413A The jar measures, outside, 8.75 x 9.65 inches, will handle from a few ounces up to 5 pounds at a charge; shipping weight, 120 pounds; floor space, 10½ x 25 inches. Hand wheel-pulley, 9 x 1 inches, 60 R.P.M. Type A Single.
Price $37.50

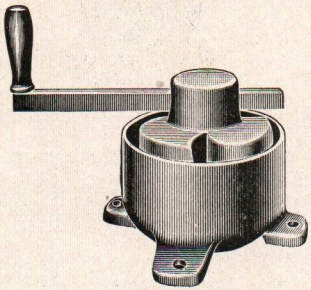
4413B For two jars; shipping weight, 195 pounds; floor space, 10½x38 inches. Hand wheel pulleys, 9x1 inches, 60 R. P. M. The sample jar measures, outside, 5.2x5.71 inches. Will handle from ¼ oz. to 1½ lbs. at a time. The laboratory jars measure 8.75x9.65 inches. Will handle from a few ounces up to 5 pounds at a time. Charges of material for all these mills are based on sand as a unit. Type A Double.



No. 4413B
Double

Price $67.50

For some very hard materials we furnish Steel Balls with these mills instead of Flint Pebbles. Larger sizes quoted on application.



No. 4413C

4413C **MORTARS,** Buck's improved, of iron, especially adapted for grinding and amalgamating. Through the manner in which the muller is constructed, the contents of the mortar again pass under the muller.

Diameter	inches	6½	8½
Weight	pounds	30	76
Weight Muller	pounds	16	49
Price	each	$7.50	$10.00

MORTARS

No. 4414A

No. 4414B

4414A **MORTARS,** with lip, glazed outside, with porcelain pestle glazed to grinding surface. Type 650.

Size number	0	1	2	3	4
Diameter, mm.	70	90	115	135	165
Inside diameter, mm.	60	90	100	115	145
Height, mm.	45	60	70	80	105
Capacity, cc.	75	165	360	600	1280
Length of pestle, mm.	113	140	180	200	255
Each	$0.35	.60	.90	1.35	2.55

4414B **MORTARS,** deep form, with lip, glazed outside with porcelain pestle. Type 651. Size number, 0; dia., 95 mm; height, 64 mm; capacity, 200 cc.; length of pestle, 113 mm. Each $0.75

4414C **MORTARS, WEDGEWOOD.** Best quality; pestle with wooden handle.

No.	0000	00	1	3	5	7	10	12
Diam. in.	3¼	4	5	6½	8	10	12½	14
Capacity, oz.	2	6	10	26	56	6 pts.	12 pts.	17 pts.
Each	$1.15	1.30	1.60	2.10	3.00	4.20	8.00	10.75

No. 4414D

No. 4414E

4414D **MORTARS, IRON.** No. 1, high style. Best quality, for powdering ore.

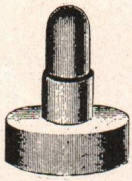
Capacity	1 pt.	1 qt.	2 qts.	1 gal.	2 gals.	3 gals.
Each	$0.75	1.00	1.40	2.25	4.25	6.00

4414E **MORTARS, IRON.** No. 2, low style. Best quality.

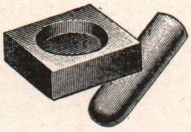
Capacity	1 qt.	2 qts.	1 gal.	2 gals.
Each	$1.50	2.00	3.00	6.00

MORTARS

No. 4415A



No. 4415B



No. 4415C

4415A **MORTARS, AGATE.** With pestles; best quality.
Diameter, 1½, 2, 2½, 3, 3½, 4, 4¼, 4½, 5, 5½ and 6 inches.
Prices on application.

4415B **MORTARS, DIAMOND, PLATTNER'S.** For crushing small quantities of ore for flattening silver buttons; made of the best tool steel, hardened and well finished.

Size	Small	Large
Each	$5.50	$7.50

4415C **MORTARS, DIAMOND, LEEDS.** Of hardened steel.....$4.00

No. 4415D

No. 4415E

4415D **MORTARS, STEEL.** Polished inside and out; with pestle.

Diameter ....inches	3½	4½	5½
Each	$3.50	4.50	6.00

4415E **MORTARS, GLASS.** With lip and pestle. Type 9665.

Capacity ....oz.	2	4	8	16	32
Each	$0.30	.40	.50	.80	1.20

MOULDS

No. 4416B

No. 4416C

No. 4416D

No. 4416E

No. 4416F

No. 4416I

4416A **MOULDS, INGOT OR BULLION.** Inside diameter, 1x1x3½ inches, capacity 35 oz. gold, 18 oz. silver $0.75

4416B **MOULDS, INGOT OR BULLION.** Inside diameter, 1½x1½x8 inches, with sliding bar to cast any length desired, capacity 150 oz. gold, 750 oz. silver 2.00

4416C **MOULDS, INGOT OR BULLION.** Capacity of moulds is figured filled within about $\frac{3}{16}$ inch of top.

Size ..... inches	3½x1x1	3½x1½x1½	4x2x2	5½x2½x2½	6½x3¼	3¼
Capacity, gold ..... oz.	20	50	100	250	500	
Capacity, silver .. oz.	10	25	56	140	275	
Each	$1.00	1.25	1.60	2.50	3.00	

Size ..... inches	9x3¾x3¾	11x4¾x4¾	11½x5¼x4½	15x7x6
Capacity, gold ..... oz.	1000	2000	2500	5000
Capacity, silver ..... oz.	550	1100	1350	3000
Each	$4.25	6.25	7.50	9.00

Lettering on above moulds, per letter $1.00

4416D **MOULDS, POURING.** Iron, with 3 conical depressions, bottom running down to a fine point, wood handle, for lead or scorification 1.00

4416E **MOULDS, POURING.** Iron, with 6 conical depressions and handle, bottom running down to a fine point, for scorification .. 1.50

4416F **MOULDS, POURING.** Iron, with 12 conical depressions, 2⅛-inch diameter, 1-inch deep; for crucible or scorification assays 1.75

4416G **MOULDS.** Same with 12 conical depressions, 3-inch diameter, 1½ inch deep, for crucible or scorification assays 2.25

4416H **MOULDS.** Same with 20 conical depressions, 2⅛-inch diameter, 1 inch deep, for crucible or scorification assays 3.00

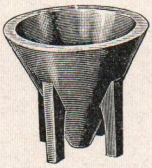
4416I **MOULDS, POURING.** Cast iron with 25 spherical depressions, for crucible or scorification assays 3.00

MOULDS

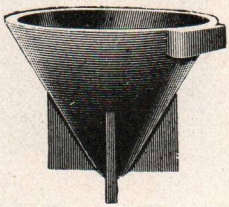
No. 4417A

No. 4417B

No. 4417D



No. 4417E



No. 4417F

4417A **MOULDS, POURING.** Heavy, solid iron, with 2 conical depressions, 2 1/8 inches diameter, 1 5/8 inches deep, wood handles, for crucible and scorification assays, each $2.50

4417B **MOULDS, POURING.** Heavy, solid iron, with 6 conical depressions, 2 1/4 inches diameter, 1 5/8 inches deep, solid iron handle. The slag will cool rapidly. Each 4.50

4417C **MOULDS, POURING.** Same as above, but with 8 depressions. Each 7.50

4417D **MOULDS, POURING.** As above, with 6 conical depressions, 2 inches diameter, 1 3/8 inches deep, with iron ring handle. Each 5.50

4417E **MOULDS, POURING.** For large crucibles, one only large depression, 6 inches diameter, 5 inches deep. Each 1.50

4417F **MOULDS, POURING.**
For Black Lead Crucible No. 7, weight 16 lbs.
For Black Lead Crucible No. 10, weight 27 lbs.
For Black Lead Crucible No. 16, weight 35 lbs.
For Black Lead Crucible No. 25, weight 50 lbs.
For Black Lead Crucible No. 35, weight 60 lbs.
For Black Lead Crucible No. 50, weight 85 lbs.
For Black Lead Crucible No. 80, weight 105 lbs.
For Black Lead Crucible No. 100 or 125, weight 135 lbs.
Prices on application.

MOULDS, CUPEL. See under Cupels.

Massco MUFFLES

No. 4418A

4418A *Massco* **MUFFLES** are of the very highest standard. They are made of Colorado Clay, (renowned throughout the world) by skilled ceramists of years of experience.

We have no hesitancy in recommending them, and will stand behind their quality to the utmost.

In ordering, please give the designating letter and the number; and it is also wise as an additional precaution to give the outside dimensions.

The list on the following page gives the standard sizes, and no difficulty should be had in selecting one to meet the requirements of everyone. Besides this list, we have many special muffles in stock. Moreover, we are glad to make special muffles according to special ideas or requirements as reasonably and quickly as possible. In ordering such special muffles, be careful to give complete information; not only dimensions, but the shape of the opening into which the muffle is to fit is needed. Also give the particulars as to the ventilating holes.

MAXIMS FOR THE CARE OF MUFFLES

1. See that the muffle has a bearing on all supports, as otherwise very disastrous strains are put upon the muffle.
2. Muffles should be dry before being put into the furnace.
3. Considerable additional life may be gained from muffles by avoiding cold air draughts striking the muffles, either in front or outside through the fire box.
4. The muffle should not be heated or cooled more rapidly than necessary. It is well to shut up the furnace after the day's work is done, allowing it to cool slowly. These precautions are also good for the furnace.
5. If anything is spilled in the muffle, put bone ash on the spot quickly.

The *Massco* Muffles will stand a great deal of abuse and radical changes in temperature, but by avoiding them and the strains incident thereto, the life of the muffle will be prolonged.

Massco MUFFLES

No. 4419A

	OUTSIDE MEASUREMENTS Always Used in Specifying Muffles				INSIDE MEASUREMENTS For Determining Capacity			
Letter	Width Inches	Length Inches	Height Inches	Shape	Width Inches	Side Height Inches	Greatest Height Inches	Price Each
AAA	2 1/2	6	1 7/8	2	.....	.....	.....	$0.70
AA	3	7	2 1/4	2	.....	.....	.....	.70
BB	3 1/2	6	2 1/2	2	.....	.....	.....	.70
CC	4 3/4	8	3	2	.....	.....	.....	.85
C	4 3/4	8	3	2	.....	.....	.....	.85
H	5 1/4	10 1/2	3 7/8	2	.....	.....	.....	1.15
GF	6	6 1/2	4 1/4	4	5	3 1/4	3 1/2	.70
GC	6	8	3 1/2	4	5 1/4	2 3/4	2 7/8	1.00
GF	6	10	4 1/4	4	5 3/8	3 1/4	3 3/8	1.00
CJ	6	12	4	2	4 7/8	1 3/4	3 1/4	1.25
CF	6	9	4	2	5 1/4	2	3 1/2	1.00
F	6	10	4	2	5 1/4	.....	3 1/8	1.00
FF	6	10	4	3	5 1/4	.....	3 1/8	1.00
J	6	12	4	3	4 7/8	.....	3 1/8	1.25
D	7	10	4 3/4	2	6	.....	3 1/2	1.00
CD	7	10 1/2	4 3/4	3	5 7/8	.....	3 1/2	1.00
DD	7	12	5	4	6 1/8	3 3/4	4 1/8	1.35
G	7	12	4 1/2	3	6	2 1/2	3 5/8	1.35
GG	7	14	5	3	6	2 3/4	3 7/8	1.65
GK	8	12	5 1/4	4	7 3/8	3 7/8	4 3/8	.1 60
KK	8	12	5	3	6 5/8	2 1/2	4	1.60
KKK	8	13	4 7/8	2	6 3/4	.....	3 3/4	1.65
K	8	14	5	3	7	2 1/2	4	1.70
LLL	9	14 1/2	5 1/2	3	7 5/8	2 3/4	4	2.00
L	9	15	5 3/4	3	7 5/8	.....	4 1/2	2.00
LL	9	15	5 3/4	3	7 3/4	2 3/4	4 3/8	2.00
FHN	9	16	6	3	7 5/8	3 1/4	4 3/4	2.00
I	10	16	6 1/2	2	8 3/8	2 5/8	5	2.35
GI	10	16	5 1/2	4	9	3 3/4	4 1/2	2.35
MH	10 1/4	16	6	2	8 1/2	3 1/2	4 3/4	2.35
HSS	10	16 1/2	6 7/8	2	8 1/2	2 1/2	5 1/2	2.35
II	10	16	6 3/4	3	8 1/2	3 1/8	5 3/8	2.35
CII	10	16 1/2	6 3/4	3	8 1/2	3 1/8	5 3/8	2.35
JJJ	10	18	6 1/4	3	8 3/8	2 5/8	5	2.70
NNN	10	19	6 1/4	3	8 3/8	2 5/8	5	2.90
MM	10	20	6 1/4	2	8 3/8	2 5/8	5	3.00
JJ	10 1/4	18	6 1/4	3	8 3/4	3 5/8	5	2.70
N	10 1/4	19	6 1/4	3	8 3/4	3 5/8	5	2.90

Massco MUFFLES

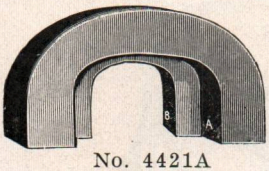
Continued No. 4420A

Letter	Width Inches	Length Inches	Heighth Inches	Shape	Width Inches	Side Height Inches	Greatest Height Inches	Price Each
M	10 1/4	20	6 1/4	3	8 3/4	3 5/8	5	$3.00
LM	10 1/4	22	6 1/4	3	8 3/4	3 5/8	5	3.35
III	10 1/4	16 1/2	6 1/4	3	8 3/4	3 5/8	4 7/8	2.70
NN	10 1/2	19	6 1/2	3	8 7/8	3 3/4	5	2.90
RR	10 1/2	21	6 1/2	3	8 7/8	3 3/4	5 1/8	3.00
BNN	10 3/4	19	6 7/8	3	9	3 3/4	5 1/8	3.00
OO	11	16	7	3	9 1/2	3	5 3/8	2.85
PP	11	18	7 1/4	3	9 3/8	3 1/2	6	3.00
P	11	18	6 1/2	3	9 3/8	3 5/8	5 1/8	2.90
GET	11	19	7	3	9 3/8	------	5 3/8	3.00
PPP	11	20	6 1/2	3	9 3/8	3 5/8	5 1/8	3.00
R	11 1/2	19	7 1/4	2	9 7/8	2 1/2	5 3/4	3.15
QVL	12 1/4	20 1/4	7 1/2	3	10 1/8	3 3/4	5 3/4	3.35
BQ	11 3/4	22 1/2	7	3	10	4	5 3/4	3.35
QQQ	12 1/4	18	7 3/4	3	10 3/4	3 5/8	6 1/8	3.35
QQ	12 1/4	19	7 3/4	3	10 3/4	3 5/8	6 1/8	3.35
Q	12 1/8	20	7 1/2	3	10 1/8	3 3/4	5 3/4	3.35
USQQ	12 1/4	21	7 3/4	3	10 3/4	3 5/8	6 1/8	3.35
KQQ	12 1/2	19	7 3/4	3	10 1/2	4	6	3.35
TM	12 3/4	20	6 3/4	3	11	3 1/2	5 1/4	3.35
S	12 1/2	20	7 3/4	3	10 3/4	3 5/8	6	3.35
SS	12 3/4	21	8 1/4	2	10 7/8	3 1/2	6 7/8	3.70
T	13	21	7 1/4	3	11 1/2	3	5 3/4	3.70
B	14	21 3/4	7 1/2	3	12 1/2	3 1/4	5 3/4	3.70
UUU	14	19	9 3/4	3	12 1/4	5 3/4	7 7/8	3.70
UU	14	19	7 1/4	3	11 7/8	3 1/2	5 1/2	3.70
U	14	18	7 1/4	3	11 7/8	3 1/2	5 1/2	3.70
GU	14	18	6 1/2	4	12 3/4	4	5	3.70
UA	14	18	8 1/4	3	11 7/8	3 1/2	6 1/2	3.70
UM	14	21 1/2	7 1/2	3	12 1/2	3 3/4	5 3/4	3.70
SI43	14	22	7 1/2	3	12 1/2	3 3/4	5 3/4	3.90
V	14 1/2	19	8 1/2	3	13 1/4	5	7	3.70
VVV	14 3/4	19 1/4	6 7/8	3	13	3 1/4	5 1/2	4.00
VV	14 5/8	19	7 3/4	3	13 1/2	3 3/4	5 7/8	4.00
TXX	16	24	9 1/4	3	14 1/2	5	7 1/2	5.35
X	16	25	7 3/4	3	14 5/8	4	6 1/4	5.35
XX	16	22	8 1/2	3	14 1/2	4 1/2	6 3/4	5.35
AF	17 1/2	23	9	3	------	------	7 1/2	5.35
TYY	20	37	10 1/2	3	For Roasting		------	14.00
Z	30	54	12	3	For Roasting		------	27.00
	4420B—SPECIAL MUFFLES FOR THE MASSCO FURNACES							
LA	6 1/2	7	4 1/2	4	5 3/4	3 1/4	3 3/4	$1.00
LB	6 1/2	10	4 1/2	4	5 3/4	3 1/2	3 3/4	1.00
LC	8 1/2	12	5 1/2	4	7 1/2	3 3/4	4 5/8	1.60
LD	10 3/4	16	6	4	9 1/2	3 3/4	4 7/8	2.70
LE	15	18	7	4	13 3/4	4	5 1/2	4.00
LX	6	8	3 1/2	4	5 1/4	2 3/4	2 3/4	3.00
	4420C—SPECIAL MUFFLES FOR AMERICAN GAS FURNACE							
A1	3 5/8	5 1/2	2 1/2	2	------	------	------	$0.70
A2	3 3/4	7 1/4	2 1/2	2	------	------	------	.70
A3	6 1/2	10	4 1/2	2	------	------	------	1.00
A4	7 1/2	13	4 5/8	2	------	------	------	1.60
A5	11 1/2	19 3/4	7 1/2	3	10	3 1/2	6	3.15
A6	13 1/2	15 1/4	6 3/4	3	11 3/4	3 1/2	5 1/2	3.35
A7	21	20	7 5/8	3	19	3 3/4	5 5/8	5.35

4420D **QA SHELF MUFFLES.** Outside Dimensions 12x19x7 3/4. One shelf, $4.00. Other sizes made to order.

MUFFLE ARCHES AND DOORS

ARCHES



No. 4421A

No. 4421C

4421A **MUFFLE ARCHES A.** 9 inches thick.

Size for muffles	LL	I	II	NN	QQ	T	U
Price	$2.20	2.50	2.50	2.50	2.60	2.80	3.00

Any other size made to order at proportionate price.

4421B **MUFFLE ARCH REDUCER B.**

Size for muffles

	LL	I	II	NN	Q	QQ	SS	U	UUU	V
Price	$0.80	.90	1.00	1.20	1.40	1.50	1.70	2.00	1.90	2.20

To diminish the opening admitting a 20 gramme crucible and to prevent cold air draft from striking the muffle when in use.

4421C **MUFFLE ARCHES.** For two-muffle assay furnace, 9 inches thick.

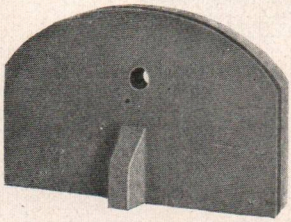
Set of 2, for muffles	LL	I	II	NN	QQ	T	U
Price per set	$4.40	4.80	5.00	5.00	5.20	5.60	6.00

4421D **MUFFLE ARCH FRONT.** For Massco three-muffle tile-lined furnace, taking NN or QQ muffles $6.00

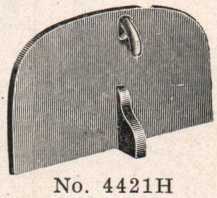
4421E **MUFFLE ARCH FRONT.** For Massco two-muffle tile-lined furnaces, size for LL-NN-QQ-UU muffles, round and flat top. Per pair 5.00

4421F **MUFFLE COOLERS.** Of fire clay to be used in front of cupels, size 1⅛x1⅛x6 ..... .35

DOORS



No. 4421G



No. 4421H

4420G **MUFFLE DOORS, CLAY.** With binding wire.

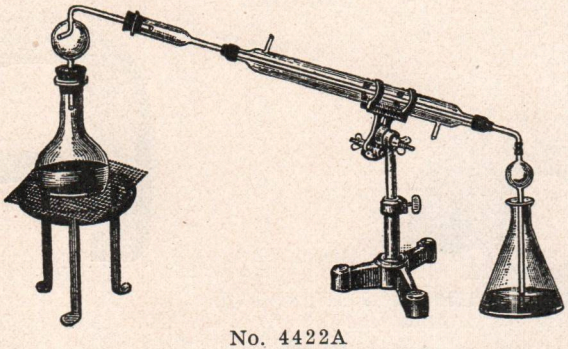
Size for muffles	LX	LA	LB	LC	LD	LE
Price	$0.40	.40	.40	.50	.50	.60
Size for muffles	GC	GE	GF	GK	GI	GU
Price	$0.50	.50	.50	.60	.60	.70
Size for muffles	LL	NN	Q	QQ	U	UUU
Price	$0.50	.50	.50	.50	.60	.70

4421H **MUFFLE DOORS, IRON.**

Size for muffles	LL	NN	QQ	U	Reducers
Price	$1.00	1.20	1.50	2.00	1.00

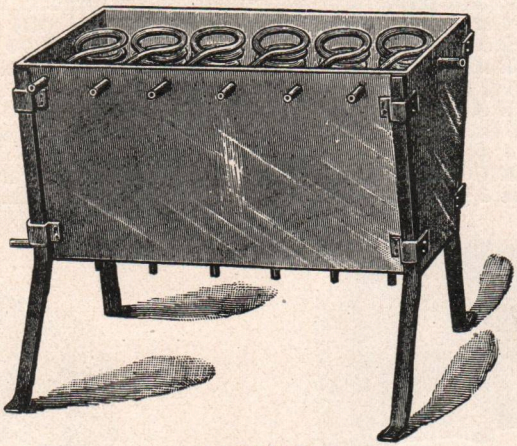
4421I **MUFFLE DOORS, SHEET IRON.** Asbestos lined, made to order for any muffle.

NITROGEN APPARATUS



No. 4422A

4422A **NITROGEN DISTILLING APPARATUS.** Kjeldahl's, for nitrogen determination modified by Reitmair and Stutzer, complete $12.00



No. 4422B

NITROGEN DETERMINATION

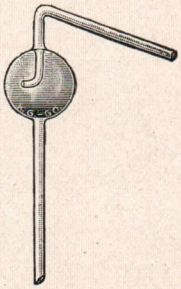
4422B **KJELDAHL'S CONDENSERS.** Of copper, tin-lined, with six coils of pure block tin, each $30.00

4422C **KJELDAHL'S DIGESTING SHELF.** Square with six burners and stopcock, each 21.00

OIL SAMPLE BOTTLES. See Bottles.

OIL CALORIMETERS. See Calorimeters.

NITROGEN DETERMINATION APPARATUS



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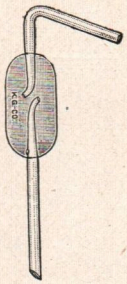

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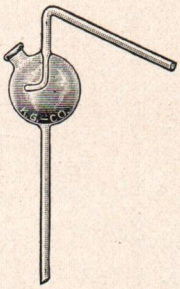

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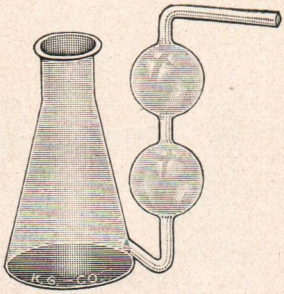


No. 4423E

4423A **BULBS, CONNECTING, KJELDAHL.** With bent connecting tubes. Type 8270. Each $0.60

4423B **BULBS, CONNECTING, KJELDAHL.** With two curved tips inside of the bulb. Type 8295. Each ..... .98

4423C **BULBS, CONNECTING, KJELDAHL.** Jenning's new form especially for water analysis, with tubulare in the bulb which permits the introduction of water or permanganate solution without removing the stopper. Type 8280. Each 1.12

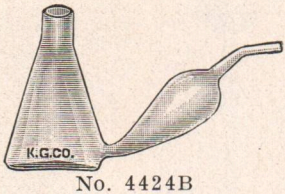
4423D **BULBS, CONNECTING, KJELDAHL.** Improved by Hopkins, with single straight tubulation inside of bulb. Type 8285. Each ..... .90

4423E **BULBS, NITROGEN, FRESENIUS.** Type 8290.

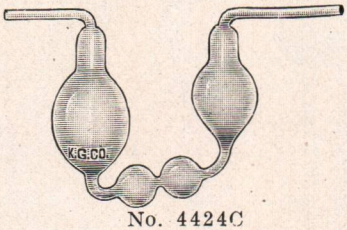
Capacity of flask, cc.	125	250
Each	$0.75	.90

NITROGEN DETERMINATION APPARATUS

No. 4424A



No. 4424B

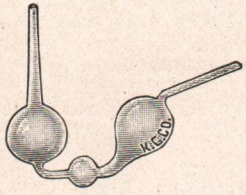


No. 4424C

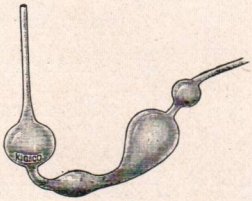
4424A **BULBS, NITROGEN, VOLHARD'S.** Improved. Type 8295. Each..$0.75

4424B **BULBS, NITROGEN, VOLHARD'S.** Latest form. Type 8300. Each ..... .90

4424C **BULBS, NITROGEN, TROILIUS.** Type 8305. Each..... .75



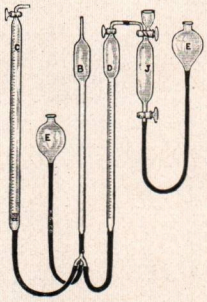
No. 4424D


No. 4424E

4424D **BULBS, NITROGEN, VARRENTRAPP AND WILLS.** With three bulbs. Type 8310. Each..... .55

4424E **BULBS, NITROGEN, VARRENTRAPP AND WILLS.** With four bulbs. Type 8315. Each..... .68

NITROGEN DETERMINATION APPARATUS



No. 4425A

No. 4425B

No. 4425C

No. 4425D

4425A **NITROMETER, DU PONT'S.** Latest modification. For original description see Journal of the Society of Chemical Industry, 1900, page 182, as used by the manufacturers of explosives, glass parts only, without support. Type 8325.

Complete	$37.00
B—Compensating Tubes only. Each	3.00
C—Large Measuring Tubes only. Each	12.00
D—Nitrogen Bulb Tubes only. Each	8.00
E—Leveling Reservoir only. Each	1.20
J—Reaction Bulb only. Each	10.00
K—Three-way Tubes only. Each	1.00

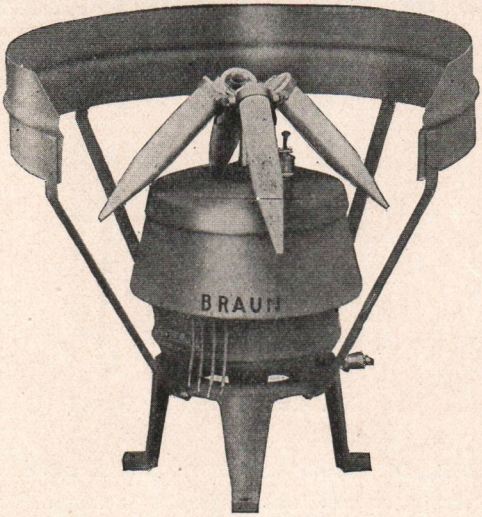
4425B **NITROMETER, LUNGE'S.** Glass parts only. Type 8330.

Capacity, cc.	50	100
Graduated into	1/10	1/5
Each	$7.00	8.00

4425C **NITROMETER, SCHIFF.** Graduated to 100 cc. in 1/5ths with reservoir; glass parts only. Type 8335. Each 9.00

4425D **NITROMETER, LUNGE'S.** As used in the determination of Nitrogen in gun powder, nitroglycerine, dynamite, etc.; graduated from 100 to 140 cc. in 1/10ths, glass parts only. Type 8340. Each 10.00

OIL AND ASPHALT TESTING APPARATUS



No. 4426A

VERTICAL DIRECT CONNECTED TYPE

OIL CENTRIFUGE, BRAUN—The Centrifuge as a means of determining the percentage of sand and water in oil, is considered to be the most accurate method. It is based upon the principle that centrifugal force separates the sand and water from oil and accomplishes in about fifteen minutes that which requires days in the settling method.

By the use of bisulpholine (a mixture of carbon bisulphide and gasoline) the precipitation of carbonaceous matter is prevented.

This machine was designed with the tubes at rest at a slight angle from the perpendicular, eliminating the danger of breaking the glass tubes as they are not subjected to the sudden jar when starting machine. The glass tubes are surrounded by liquid in aluminum shields which acts as a cushion and prevents breakage.

When the glass tubes are removed from the aluminum shields a distinct reading straight across the graduation is secured.

This machine is directly connected to the motor, which latter is amply protected with an iron shield. There is no possible danger either of injuring motor or from fire. The annoyance of slipping belts is eliminated.

The machine occupies a minimum amount of space and can be installed either on a bench or on the floor. A special shield is furnished which is fastened directly to the machine to protect the operator in case of accident.

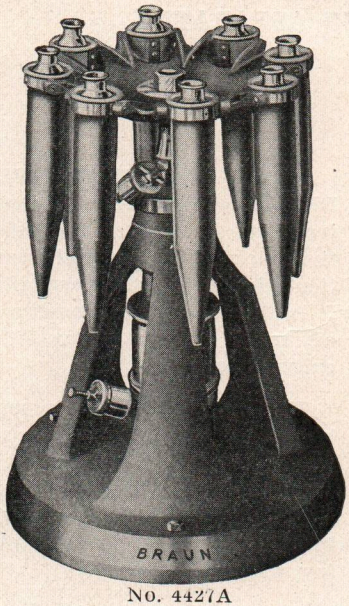
The motor has a special starting device, which allows a gradual start.

Always state voltage and cycles. Graduated glass tubes No. 4776 are included with each machine.

4426A **ALTERNATING CURRENT TYPE,** for four tubes. Price each..$160.00

4426B **DIRECT CURRENT TYPE,** for four tubes. Made to order only. Price each..... 160.00

OIL AND ASPHALT TESTING APPARATUS



No. 4427A

OIL CENTRIFUGE BRAUN. Vertical type, belt driven. Can be operated by any source of power available. Type 4427A requires ¼ H. P. Types 4427B and 4427C require ½ H. P. The machines are very substantially built and equipped with roller bearings. Graduated glass tubes Type 4776 are included with each machine.

4427A **OIL CENTRIFUGE.** For two tubes. Each $125.00
4427B **OIL CENTRIFUGE.** For four tubes. Each 140.00
4427C **OIL CENTRIFUGE.** For eight tubes. Each 175.00

DIRECTIONS FOR MAKING CENTRIFUGAL TESTS OF OIL

CHEMICAL REQUIRED—10 per cent solution hydrochloric acid C P and distilled water; 35 per cent solution zinc sulphate; bisulpholine.

Fill the Centrifuge glasses to the 50 cc. mark with bisulpholine, being particular to have the lower line of the miniscus even with this mark; add two drops of the 10 per cent hydrochloric acid solution. Thoroughly stir the oil you wish to test and carefully fill the balance of the glass to the 100 cc. mark with oil. Stopper the glasses thoroughly with a cork and shake, thereby mixing the contents; remove the corks; then place each glass in the shell of corresponding number.

Pour sufficient quantity of Zinc Sulphate Solution into the shells to float the glasses and their contents, thereby raising them ¼ inch from the bottom of the shells. Care should be taken not to put in too much, as you will raise the glasses more than ¼ inch, which will cause them to come together at the top. The object of this solution is to act as a cushion and prevent the glasses when in speed, being driven down gainst the bottom of the metal shells and broken.

Run the machine for 15 minutes. Take out the glasses and the percentage of water and foreign matter can be easily read. Should you not get a clear and distinct reading, draw off the mixture of Bisulpholine and Oil with a pipette down to within ½ inch of the foreign matter, then fill up your glass again with Bisulproline to the 100 cc mark, shake thoroughly, place in the machine and run again for 15 minutes, after which your readings will be clear and distinct.

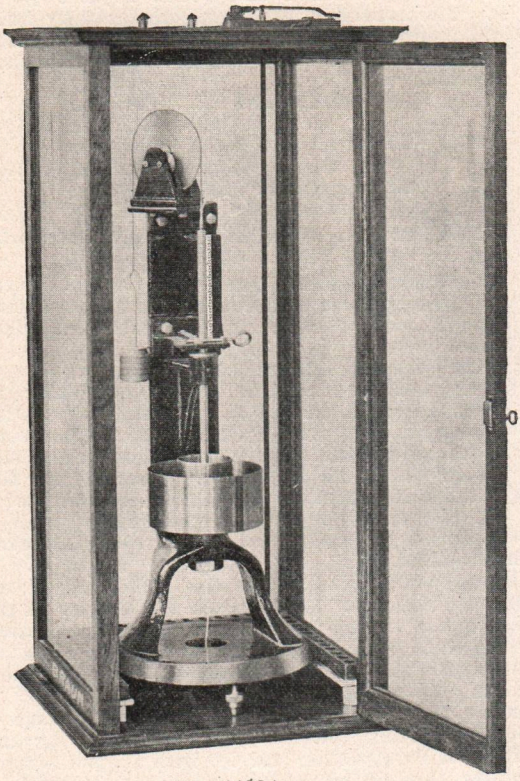
The Glasses are graduated in cubic centimeters as follows:

First cc in tenths.
Second cc in fifths.
Third cc in fifths.
Fourth cc in halves.
Fifth cc in halves.

The balance of the markings on the glass denote the number of cc's. Taking 50 cc of Oil and 50 cc of Bisulpholine, it is necessary to multiply the result by 2 to get the correct reading; for instance, if the line of separation should show at the sixth line from the bottom, you would multiply by 2, which would give you 1.2 per cent. If the line of separation shows at the second line above the 1 cc mark, this space between the 1 cc and the 2 cc being divided into 5's, the percentage would be 2.8 per cent.

Bisulpholine is a mixture of Carbon Bisulphide (redistilled) and Gasoline. This mixture dissolves the small particles of asphaltine and gives correct readings. When gasoline only is used in connection with a centrifuge machine, the asphaltine is deposited with the sand and water at the bottom of the tube and consequently the results obtained would be too high.

OIL AND ASPHALT TESTING APPARATUS



No. 4428A

4428A **ADHEVISEMETER, BROWN.** The Brown Adhesivemeter determines the relative thickness of materials, particularly road oils and asphalts. It is simply but well constructed, which eliminates any difficulty in operation.

The cast iron frame is very heavy and re-enforced at all arms, which makes it perfectly rigid and free from vibration. Levelling screws in the round base permit of accurate levelling when necessary.

The bearings are made of brass and are held in place in such a manner as to render them secure against any displacement. The lower bearing is one-half inch in diameter, and one-half inch in length; the upper bearing is slightly larger than the lower, and is about two inches in length. This serves to hold the rod directly in line.

The steel rod is practically perfect as the tests depend largely upon the accuracy of this rod. It is made by Browne & Sharp, which insures the highest accuracy. The steel rod is counter-balanced by weights, the connecting string passes over a frictionless pulley. Additional weights are provided for making the various tests. The rod is held at the desired elevation by a special clamp which is released when the test is started.

The rod is coated with oil and the test depends on the speed with which the rod passes through the lower bearing. As the rod passes through this bearing the oil is cleaned off. If the oil is not sticky, the rod passes down very quickly. The stickier the oil the slower the movement, and when the oil is very sticky, weight is added to the rod, as per specifications, and in exceptional cases, the temperature of the oil is increased. The distance the rod travels is measured on a millimeter scale attached to the frame immediately above the upper bearing.

OIL AND ASPHALT TESTING APPARATUS

The time required for the rod to travel 10 centimeters depends upon the character of the asphalt in the oil, the per cent of the asphalt, the percentage of wax, the percentage of lubricating oil, the gravity of the fluxing agent, the temperature and the weight applied.

Water maintained at the proper temperature immediately surrounds the lower bearing and the cup in which the oil to be tested is placed. The heated water insures the proper temperature of the oil, even though the air temperature in the cabinet should fluctuate slightly.

Extra Cups and extra Rods can be supplied at slight additional cost, which will enable a number of samples to be maintained at the proper temperature, allowing of cleaning the cup and rod while making other tests.

The apparatus is best mounted in a special glass case equipped with electrical heaters which maintain a uniform temperature, being controlled by special thermostats. We urgently recommend the installation of the Brown Adhesivemeter in the special glass case as described in order to secure the most accurate results.

4429A **BROWN ADHESIVEMETER,** without case. Type 4795. Each..$150.00

4429B **GLASS CASE,** with electrical heaters. Type 4796. Each..... 65.00

THE STICKINESS TEST—ITS VALUE

The stickiness or adhesive qualities of oils indicates their rleative binding properties. A satisfactory oil for road work must be very adhesive and have great cohesive strength. Having coated the rock, and sanded the road, it must adhere to them, bind them together and hold them to whatever base is used|

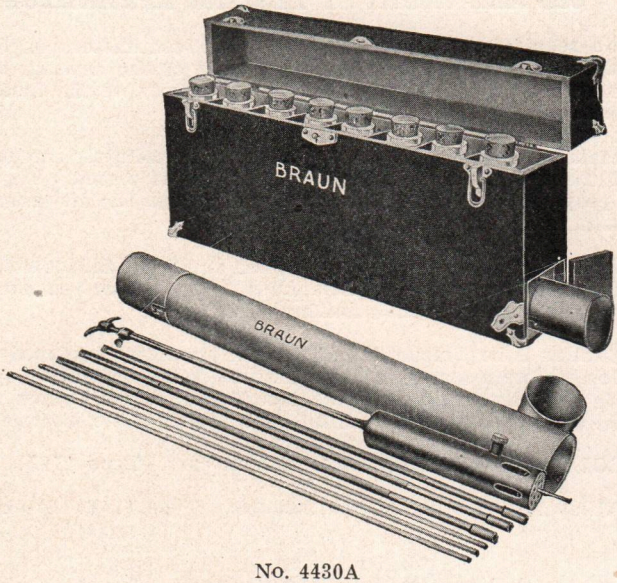
The value of the test, however, depends largely upon the interpretation of the result. Two road oils, each containing 90% asphalt ,may have the same stickiness, and yet one may be much better for road purposes than the other. The controlling factor is the time required to reduce the asphalt to a penetration of 80 on the Brown Evaporator. When this factor is taken into consideration there can be no question as to their relative values.

The stickiness depends on the per cent of asphalt; character of the asphalt; character of the petrolenes; temperature; weight applied, and the character of the solvent for the asphalt.

Following we quote an extract from the specifications based on the stickiness or adhesive test:

Temperature 77° F. Weight Applied 760 grams		Temperature 95° F. Weight 760 grams.	
Per Cent of Asphalt	Adhesiveness (seconds)	Per Cent of Asphalt	Adhesiveness (seconds)
88	200	91	100
29	305	92	185
90	430	93	290

OIL AND ASPHALT TESTING APPARATUS



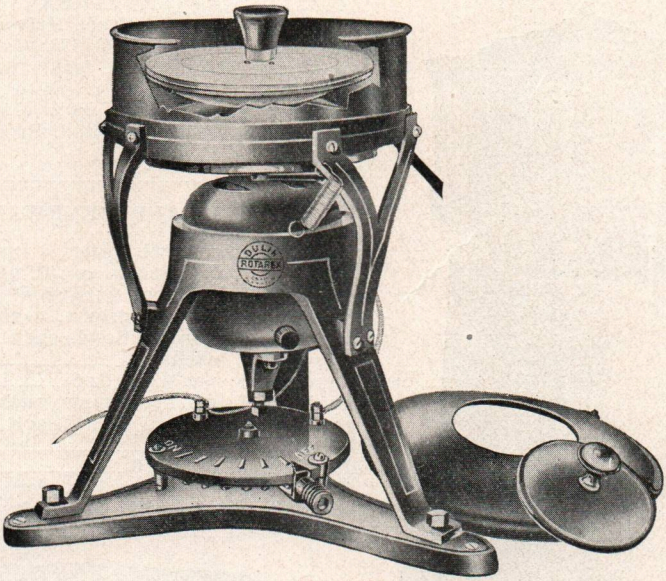
No. 4430A

4430A **OIL THIEF, BLACKMAR.** This apparatus was designed by Mr. C. A. Blackmar, chief of Department of Oil Inspection of Los Angeles, and is intended for taking samples of oil from tank cars or other storage vessels. This is a light, compact piece of apparatus, enabling one to secure samples from either the top, center or bottom of any quantity of oil, and constructed in such a way that when the point where the oil is to be tested is reached, by dropping a lever the receptacle is filled up, and on raising this the oil is held intact until it is dispatched into a bottle or other container by the operator. It will take 8-oz. samples and will operate to a depth of twelve feet. The outfit consists of the Oil Thief in zinc case, eight 8-ounce bottles with cork stoppers, each fitting snugly into its compartment, packed in a substantial carrying case fitted with lock and handle. Dimensions of case, 25 in. long, 11 in. high, 3½ in. wide. Type 4800. Each $25.00

4430B **OIL THIEF.** In zinc case, separate from above. Type 4802. Each 15.00

4430C **OIL THIEF, RORRISON.** Designed by Mr. W. Rorrison of the Dansmore-Stabler Refining Co. The outfit consists of a heavy glass tube mounted in a brass frame. The special valve at the bottom is opened and the set nut is placed at the required height on the rod. The tube is then lowered into the tank, the oil passing through the tube until the proper depth has been reached, when the valve is sprung by striking the set nut. It will take 12-oz. samples and will operate to any depth. The rod regularly furnished will permit taking samples to a height of four feet from bottom of tank. Longer rods furnished at a slight additional cost. Type 4804. Each 16.00

OIL AND ASPHALT TESTING APPARATUS



No. 4431A

4431A **THE DULIN ROTAREX** is designed for extracting bituminous aggregates and is adapted for bitulithic, macadam or ordinary surface mixtures.

These machines are equipped with specially constructed vertical type motors that will operate on either alternating current, 110 volts, 60 cycles, or direct current, 110 volts. By inserting a suitable resistance they can also be operated on 220 volts circuit.

A heavy flywheel is attached to the motor shaft. This has the effect of balancing the load and consequently reducing vibration to a minimum.

An aluminum bowl is fitted with a hollow axle which fits over the motor shaft and is surrounded by a cylindrical copper shell which catches the discharged soluble material; the bottom of the shell is so inclined as to drain through a spout.

The copper bowl is fitted with a two-piece cover, the smaller of which is removed when adding additional solvent.

Filter paper is placed beneath the filter ring and both are inserted between the cover and edge of aluminum bowl. The cover is held firmly in place by a filler screw which engages with the threaded hollow axle. Through this filler screw the solvent is added as needed.

IMPORTANT FEATURES

1. **RAPIDITY**—Complete extraction in from five to ten minutes.
2. **LARGE SAMPLES**—Insure increased accuracy and are handled as quickly as small samples.
3. **COARSE AGGREGATE**—Permits running samples containing coarse mineral aggregate found in asphaltic concrete and bitulithic pavements.
4. **BITUMEN**—Advantageous in securing a considerable amount of bitumen from the pavement, which can be used for tests on the asphaltic cement.

OIL AND ASPHALT TESTING APPARATUS

No. 4432A

4432A **DULIN ROTAREX No. 1**—Capacity 50 grams. Direct drive, vertical type motor for 110 volts D. C. or A. C. (excepting 25 cycles or less) mounted in iron frame. Complete with rheostat mounted on base, cord with plug for attaching to lamp socket, and directions for operating.
Price each $70.00

EXTRAS AND RENEWALS

Note—Extra bowls with a capacity of 100 grams, and made to fit the No. 1 Dulin Rotarex can be furnished on order.

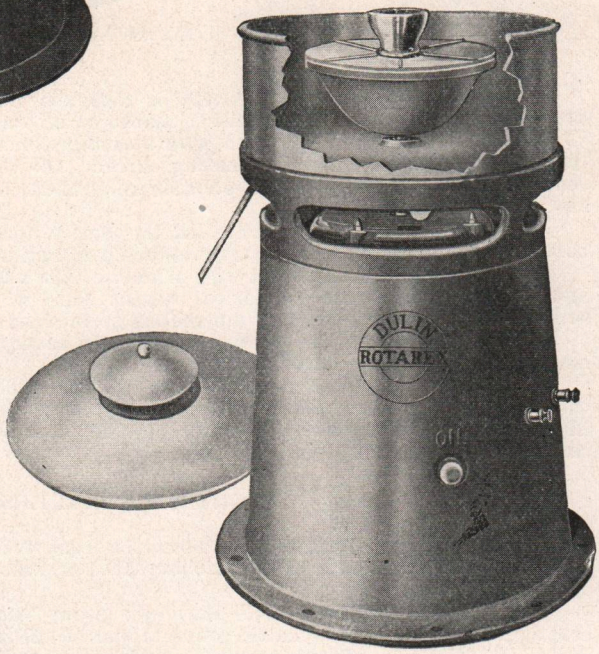
Aluminum Bowl, 50 grams, each	$5.00
Cover for Aluminum Bowl, each	2.50
Filler Screw, each	1.50
Filter Rings, per 100, each	1.50
Aluminum Bowl, 100 grams, each	7.50
Cover for Aluminum Bowl, each	3.50
Filler Screw, each	1.75
Filter Rings, per 100	3.25

Plug, with extra socket, for operating Rotarex in series with 110 volt incandescent lamp on 220-volt circuit.

4432B **DULIN ROTAREX No. 2.** Capacity 1000 grams. Direct drive, vertical type motor for 110 volts D. C. or A. C. (excepting 25 cycles or less) enclosed in cast iron frame. Complete with rheostat, and directions for operating.
Price each $140.00

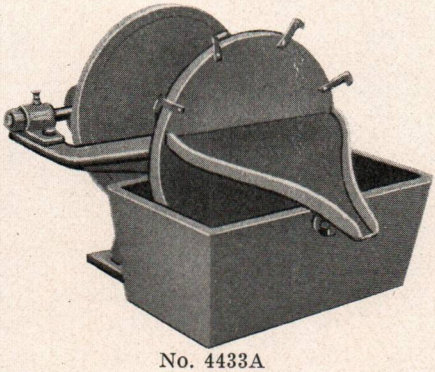
EXTRAS AND RENEWALS

	Price each
Aluminum Bowl, 1000 grams	$10.00
Cover for Aluminum Bowl	7.50
Filler Screw	2.00
Filter Rings, per 100	5.00



No. 4432B

OIL AND ACID FEEDER



No. 4433A

"PERFECTION" OIL AND ACID FEEDER FOR FLOTATION PROCESS

The main feature of development in ore dressing during recent years has been the successful employment of flotation methods in the separation of valuable mineral from worthless gangue. It is generally conceded that the principles concerned deal with the mechanics of the free surface of a liquid in contact with solids, and include adhesion, surface tension and superficial viscosity.

By the proper application of water, oils and acids, together with the necessary agitation in the tank in which the ore is being treated, small rising bubbles are formed, which selectively attach themselves to the particles of metallic sulphide and float them to the surface where they are drawn off as an oily metallic scum, the gangue settling to the bottom.

In ore flotation practice, all metallurgists will agree that success as applied to the more delicate separation of ores depends largely on definite and regular feeding of oils and acids.

After trying many devices, the "PERFECTION" OIL AND ACID FEEDER was constructed and found to be a very desirable appliance in the operation of a flotation machine.

PRICES

		Weight Net Lbs.	Weight Gross Lbs.	Price, f. o. b. Denver, Colo.
4433A	Type "O" Single Oil	65	90	$ 60.00
4433B	Type "OO" Duplex Oil	115	160	120.00
4433C	Type "A" Single Acid	65	90	75.00
4433D	Type "AA" Duplex Acid	115	160	150.00
4433E	Type "OA" Duplex Oil and Acid	115	116	140.00

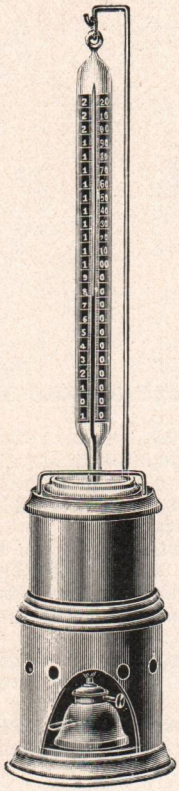
For export shipment the prices and weights are the same as for domestic shipment.

When ordering Types "A", "AA" and "OA", specify the kind of acid used.

Dimensions over all: Type "O" and Type "A": 16 inches wide by 18 inches long by 13 iinches high. Types "OO", "AA" and "OA": 29 inches wide by 18 inches long by 13 inches high. Drive pulley 5½ inches in diameter and 3⅜ inches in diameter, grooved for $\frac{5}{16}$-inch diameter round belt.

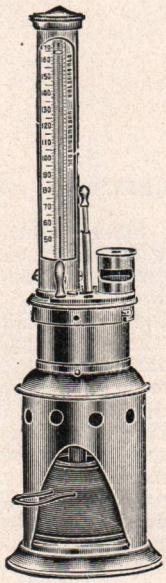
Types "O", "OO" and "A" are carried in stock for prompt shipment. Types "AA" and "OA" will be made on special order.

OIL TESTING APPARATUS



No. 4434A

No. 4434B



No. 4434C

4434A **TAGLIABUE IMPROVED OPEN TESTER** for flash and fire tests of illuminating oil, with standard thermometer. Equipped with gas flame testing burner. The flame from the gas burner can be regulated by stop-cock; must be no larger than the white button shown in cut at left of thermometer. The testing burner is used with wheel for the dip test; without wheel for the bar or cross test $10.00

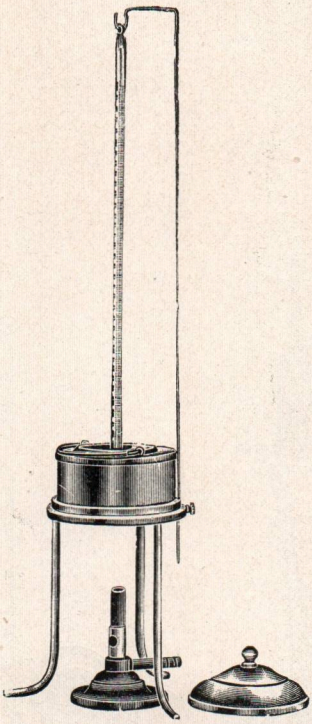
4434B **FIRE TESTER, ELLIOTT'S.** As adopted by the New York State Board of Health. To ascertain at what temperature oil will flash or explode. With standard thermometer 15.00

4434C **PYROMETER, TAGLIABUE'S COAL OIL.** Small size. To ascertain at what temperature will flash or explode. With standard thermometer ranging from about 50° to 170°, or 80° to 250° F. 28.80

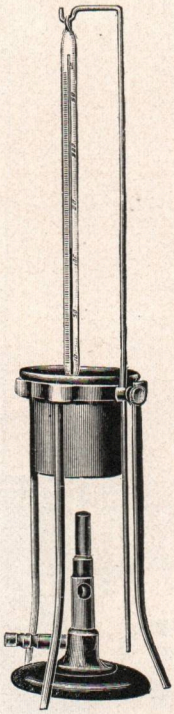
4434D **PYROMETER, TAGLIABUE'S COAL OIL.** Large size. Same as No. 4305 ..... 32.40

4434E **PYROMETER, TAGLIABUE'S COAL OIL.** Large size. Same as No. 4434D, with Bunsen burner, and thermometer ranging from about 80° to 400°, or 200° to 600° F. 38.90

OIL TESTING APPARATUS



No. 4435A



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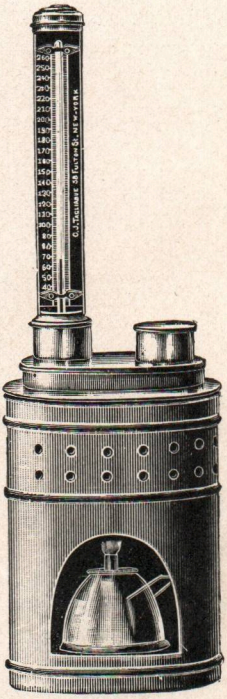


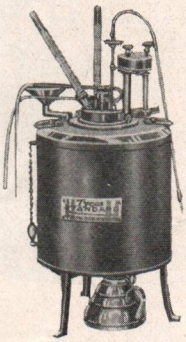
No. 4435C

4435A **OPEN FIRE TESTER, CLEVELAND.** For high grade lubricating oils. The most substantial tester on the market, being made of heavy brass castings. Complete with standard solid glass thermometer, 80° to about 640°, spirit lamp, and Bunsen burner for gas.....$15.00

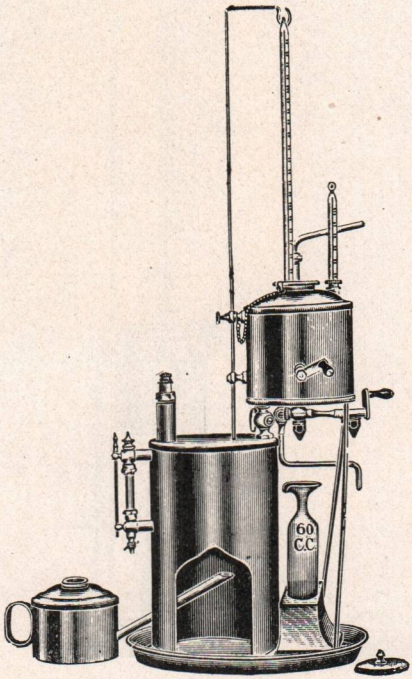
4435B **OPEN FIRE TESTER, CLEVELAND.** Small size. Similar to No. 4435A, but of lighter construction, complete with thermometer and Bunsen burner..... 11.00

4435C **FIRE TESTER, FOSTER'S.** To ascertain at what temperature oil will flash or explode. With standard thermometer..... 18.00

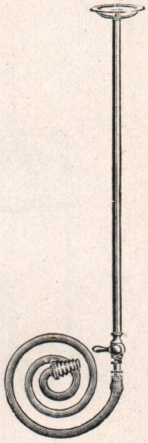
OIL TESTING APPARATUS



No. 4436A



No. 4436C



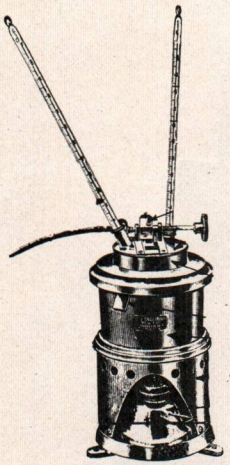
No. 4436B

4436A **FLASH POINT TESTER,** as recommended by the U. S. Bureau of Mines, for light oils. Complete with three thermometers, barometer, instructions and portable case.....$170.00

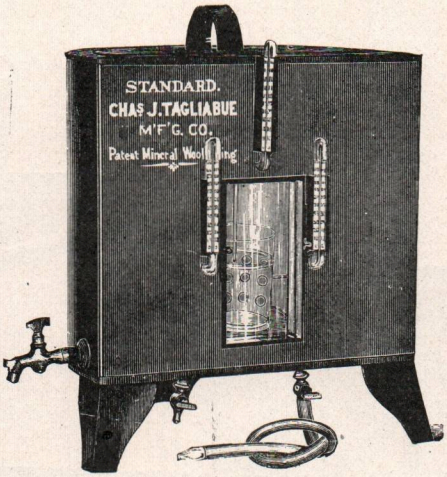
4436B **GAS FLAME TESTING BURNER** for Tagliabue Improved Open Tester, with wheel, stop-cock and hose..... 2.00

4436C **VISCOSIMETER, TAGLIABUE'S.** For determining vicosity of oils. Each instrument is thoroughly tested and standardized before leaving the factory. With directions..... 105.00

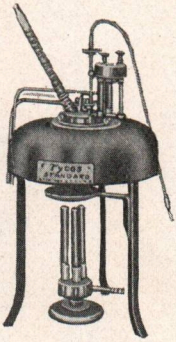
OIL TESTING APPARATUS



No. 4437A



No. 4437B



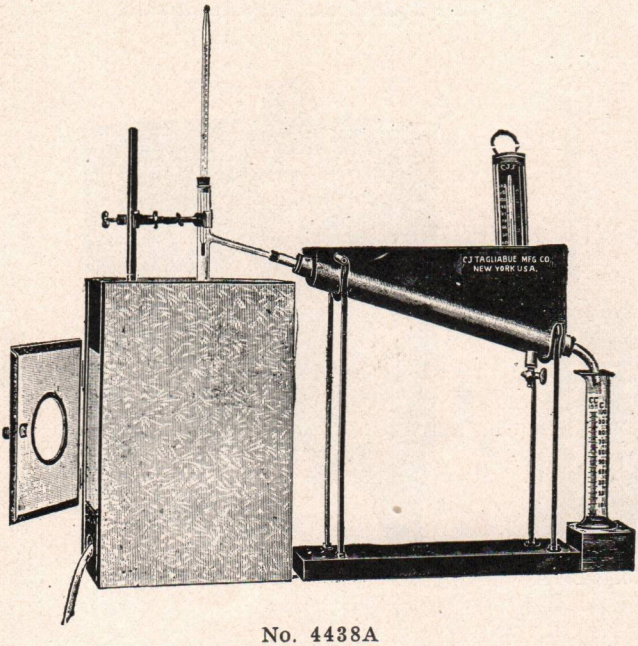
No. 4437C

4437A **OIL TESTER (FREEZER),** for determining the temperature at which any lubricating oil will congeal. Complete with three special standard angle thermometers..... $ 72.00

4437B **FLASH POINT TESTER.** As recommended by the U. S. Bureau of Mines, for heavy oils. Has device for automatically depressing the test flame at equal intervals. Complete with two thermometers and instructions, in portable case..... 150.00

4437C **FLASH POINT TESTER,** for the determination of flash point of volatile inflammable liquids. This new and simple form of closed tester has been developed to meet a general demand for an instrument of dependable accuracy but free from complicated mechanisms, easy to clean and to operate, and moderately priced. May be operated with gas or oil to supply the ignition flame, without any change in the apparatus, the gas flowing through the oil chamber when gas is used. Complete as illustrated..... 60.00

OIL AND ASPHALT TESTING APPARATUS



No. 4438A

BOILING POINT TESTER FOR GASOLINE

This distillation apparatus has been disigned and perfected along scientific lines, and admirably fills a long-felt need for a simple and efficient apparatus for the distillation and analysis of gasoline, blended gasolines, and paint thinners other than turpentine. It has been adopted by the American Society for Testing Materials, also the Independent Oil Men's and Western Jobbers' Associations.

4438A **THE DISTILLATING APPARATUS** for testing boiling and end point of gasoline, etc, complete. Type 32514A. With Bunsen burner $44.00

4438B With Alcohol Lamp. Type 32514B 52.00

4438C With Electric Heater. Type 32514C 75.00

4438D Separate Alcohol Lamp. Type 32514D 8.00

4438E Separate Electric Heater. Type 32514E 33.00

4438F **MELTING POINT TESTER,** for tar, pitch, etc. The "TAG" improved apparatus for determining the melting point of pitch, tar, etc. Simple and efficient. Type 32515 ..... 18.00

Important—Specify voltage for electric heater. Unless otherwise stated, 110 volt will be supplied, which will operate on either A. C. or D. C.

COMBINATION OIL THIEVE AND B. S. GLASS

No. 4439A

No. 4439F

This instrument has been designed to enable inspectors to obtain samples of oil or other liquids in tanks, deposits or bulk vessels, in order to determine their quality, and to detect the presence of water or other foreign matter.

Its construction is very simple, as will be seen by illustration No. 4439A. Samples may be taken at any desired distance from the top by attaching a tape measure, and from the bottom, at a distance of from 1 to 15 inches, by means of a sectional rod which accompanies each instrument; merely screw on rod section of same length as distance from bottom where sample is to be obtained. The combination of the graduated glass front makes it a perfect B. S. Glass, as samples may be allowed to settle and the amount of sediment readily ascertained without the use of any other appliance. On the central rod of instrument is fastened a delicate thermometer, so that the temperature of liquid may be obtained at the time of taking sample from container.

There is nothing in the instrument to get out of order. It is strongly made, and experts who use it say it is perfect in operation and practically indispensable.

SAYBOLT WATER INDICATOR AND OIL SAMPLER

This is an instrument for accurately measuring the depth of water that may settle in the bottom on an oil tank, and for drawing a sample of oil or water therefrom.

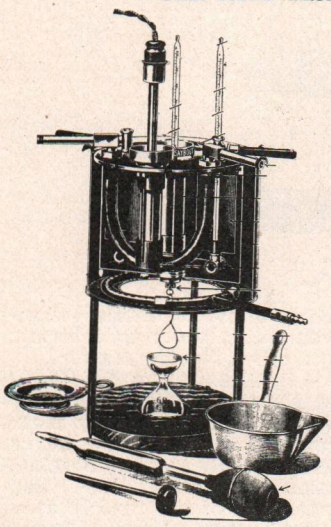
It consists of a square metal tube 12 inches long, with heavy bottom. A scale, fastened on one side by screws, is divided in inches and tenths of inches.

Upon the opposite side, running its whole length, is an adjustable strip of metal controlled by a set of screws, to hold fast the strip of prepared paper, whose function is to show the water depth by having its colored surface removed and made white on that portion immersed in the water, that portion coming in contact with oil only, not being affected. A perfectly well defined line of white will show on the paper the depth of water in the tank, and the instrument will contain a sample of the oil in tank if there is less than 12 inches of water.

From the cut it is evident that a strip of paper of any length from 1 to 12 inches may be adjusted to the instrument, depending upon the depth of water suspected of being in the tank. This enables an economical use of the prepared paper.

4439A	**G. TAGLIABUE'S STANDARD COMBINATION OIL THIEVE AND B. S. GLASS,** complete with thermometer. Type 32594	$36.00
4439B	**GLASS THIEVE** for oil, improved form with rubber bumper. Type 32597	2.50
4439C	**GLASS THIEVE** for turpentine, improved form with rubber bumper. Type 32600	2.50
4439D	**GLASS THIEVE** for oil. Type 32603	2.00
4439E	**GLASS THIEVE** for turpentine. Type 32606	2.00
4439F	**SAYBOLT WATER INDICATOR AND OIL SAMPLER,** with 50 strips paper. Type 32609	13.50
4439G	Additional paper, per 100 strips. Type 32610	1.80

OIL AND ASPHALT TESTING APPARATUS



No. 4440A

4440A **VISCOSIMETER, SAYBOLT UNIVERSAL.** This apparatus is an improved model, adapted for steam, gas or electric heating. A stirring attachment has also been added. The Saybolt is the standard for testing cylinder, valve and similar oils with bath at 212° F. and oil at 210°F., for testing reduced black oils with bath about and oil at 130° F., for testing neutral, spindle, paraffine, red and other distilled oils with bath about and oil at 100° F., or at any temperature from 70° to 212° F. The Saybolt Viscosimeter is equipped complete with electric heating device, with cord and attachment plug, steam heater, gas burner and turn table stirring arrangement. A stop watch is also provided.

NET PRICE OF SAYBOLT STANDARD UNIVERSAL VISCOSIMETER INCLUDING SIX THERMOMETERS

Note—These three numbers are the only net prices in this catalog. All other prices are subject to discount.

		Net, Each
4440B	With Stop-Watch. Type 32523	$82.00
4440C	Without Stop-Watch. Type 32525	75.00
4440D	Turn table arrangement only, with steam, gas and electric heating attachments for equipping old style Saybolt Viscosimeters. Type 32571	25.00

In ordering Turn Table, please give us the number which appears on the inner oil tube of your Viscosimeter.

LIST PRICE OF SAYBOLT VISCOSIMETER THERMOMETERS

Solid glass, etched scale Thermometers for Saybolt Standard Universal Viscosimeter only.

		List, Doz.
4440E	70° to 110° F. Type 32530	$43.20
4440F	100° to 140° F. Type 32533	43.20
4440G	180° to 220° F. Type 32535	43.20

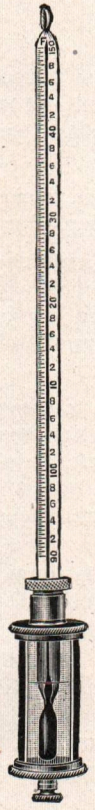
SAYBOLT VISCOSIMETER GLASSES

		List, Each
4440H	60 cc. Receiving Glass. Type 32538	$2.50

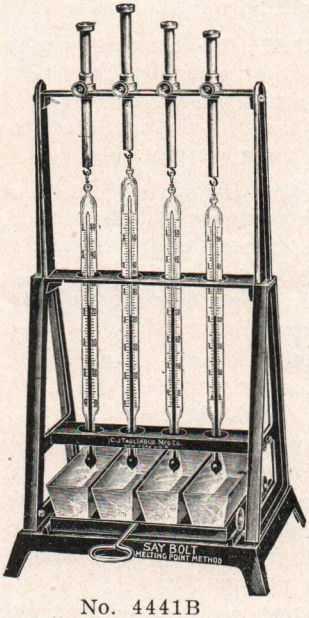
OIL AND ASPHALT TESTING APPARATUS

THE "TAG" MELTING POINT TESTER FOR WAX

SAYBOLDT'S IMPROVED WAX TESTER



No. 4441A



No. 4441B

This simple and inexpensive device is especially desirable where there is not sufficient testing to warrant the purchase of the Sayboldt Improved Wax Tester.

There are only three parts to the "TAG" Wax Tester. It is thoroughly reliable, easy to operate and well constructed.

4441A **THE "TAG" MELTING POINT TESTER FOR WAX,** complete with thermometer. Type 32516 ..... $20.00

Sayboldt's Improved Apparatus for determining the melting point of paraffine ,stearic and other crystalline wax, represents the maximum in simplicity, efficiency and dependability.

Four samples may be tested at the same time but when only a small sample is available, a special wax-holding box and an adjustable stop can be conveniently used. These are included with each tester.

4441B **SAYBOLDT'S IMPROVED WAX TESTER,** complete with four thermometers. Type 32517. ..... $70.00

Patent Applied For

No. 4442A

PALAU is a special rare metal alloy developed and sold for the purpose of replacing costly platinum laboratory utensils. PALAU—the result of painstaking research—is the only satisfactory substitute yet offered which has the many requisites for replacing platinum.

PALAU has a specific gravity of 17.22 or 8/10 that of platinum, a melting point of 1370° C., is harder and has greater tensile strength than platinum.

PALAU, the chemically-resistant laboratory ware, is the equal, and for some purposes, the superior of platinum. PALAU has been in use in chemical and metallurgical laboratories for over three years and has been given a rigorous test by the United States Bureau of Standards. A copy of their report will be mailed upon request.

PALAU is superior to most platinum now in use in resistance to loss upon heating to 1200° C., absence of iron, and loss in dilute acids after heating. PALU is the equal of platinum in resistance to Hydrochloric, Nitric, Sulphuric and Hydrofluoric Acids, Ammonia and Sodium Sulphide. PALAU is especially alkali resistant, being less attacked than plantinum by fused sodium carbonate and sodium hydroxide.

PALAU should be given the same care and treatment as platinum, and the same precautions to be observed will apply to PALAU. However, the following should be noted:

PALAU should not be heated in the flame of an air blast. PALAU will stand continuously 1300° C., but with a blast lamp very frequently a higher temperature than the melting point of PALAU will obtain. Any regular laboratory burner may be used, but one of the improved types giving a uniform flame is to be preferred to the common Bunsen Burner, which gives poor combustion and an uneven flame.

PALAU must not be used with iron or nickel-chromium triangles or nickel-chromium tipped tongs. A silica, or ordinary clay triangle is satisfactory.

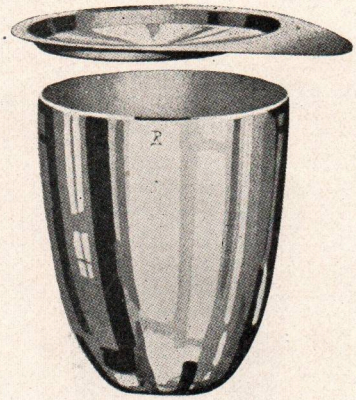
PALAU should not be used for sodium peroxide or pyrosulphate fusions. With fusions containing Sodium Carbonate and alkali nitrates, less loss is observed with PALAU than with platinum, but it should be borne in mind that PALAU will be somewhat attacked.

PALAU is not satisfactory for use as the positive electrodes or anode in electrolytic determinations. For use on the cathode PALAU is, however, entirely satisfactory, the weight remaining unchanged.

PALAU is sold throughout the United States and foreign countries at an established selling price, which as compared, article to article, is only about one-half that of platinum.

All Prices on PALAU ware on application.

PALAU CRUCIBLES



No. 4443A

PALAU CRUCIBLES—Hammered and Guaranteed

Covers are always furnished unless otherwise specified.

Number	4443A	4443B	4443C	4443D
Capacity	10	15	20	25 cc.
Diameter and Depth	2.5	3.0	3.3	3.5 cm.
Weight of Crucible	6.6	10.0	13.7	17.4 grams
Weight of Cover	1.4	2.0	2.3	2.6 grams
Weight, total	8.0	12.0	16.0	20.0 grams

Number	4443E	4443F	4443G	4443H
Capacity	30	40	50	60 cc.
Diameter and Depth	3.9	4.2	4.4	4.7 cm.
Weight of Crucible	21.0	28.0	35.0	43.0 grams
Weight of Cover	3.0	4.0	5.0	5.0 grams
Weight, total	24.0	32.0	40.0	48.0 grams

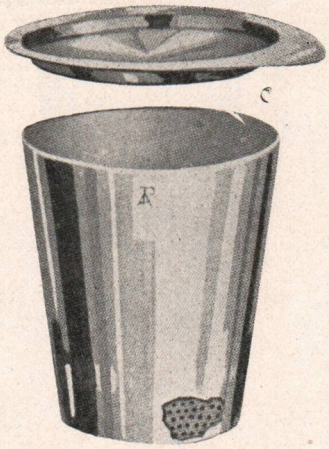
The weights listed are approximate.

Crucibles of special weights and capacities made to order.

Prices on application.

CRUCIBLES

GOOCH FORM



No. 4444A

PALAU CRUCIBLES, GOOCH FORM, Guaranteed

Covers are always furnished unless otherwise specified.

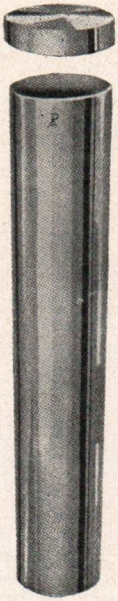
Number	4444A	4444B	4444C	4444D	4444E
Capacity	10	15	20	25	30 cc.
Diameter and Depth	2.7	3.0	3.3	3.6	3.9 cm.
Weight of Crucible	6.6	10.0	13.7	17.4	21.0 grams
Weight of Cover	1.4	2.0	2.3	2.6	3.0 grams
Weight, total	8.0	12.0	16.0	20.0	24.0 grams

The weights listed are approximate.

Gooch Crucibles of special weights and capacities made to order.

Prices on application.

CRUCIBLES



No. 4445A

J. LAWRENCE SMITH FORM FOR ALKALI DETERMINATION.

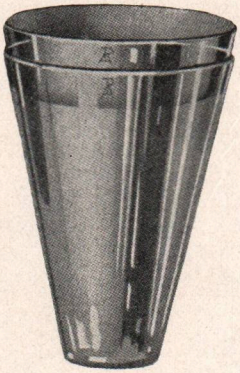
Capacity cc.	Diameter of top cm.	Diameter of bottom cm.	Height cm.	Weight Crucible grams	Weight Cover grams	Weight Total grams
18	1.8	1.5	8.0	26.5	3.5	30.0

The weights listed are approximate.

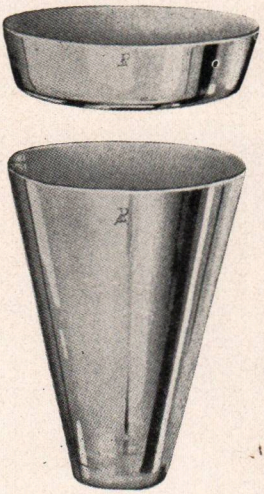
Crucibles of special weights and capacities made to order.

Prices on application.

CRUCIBLES



No. 4446A



No. 4446B

UNIVERSAL FUSION CRUCIBLE

H. L. Payne Form

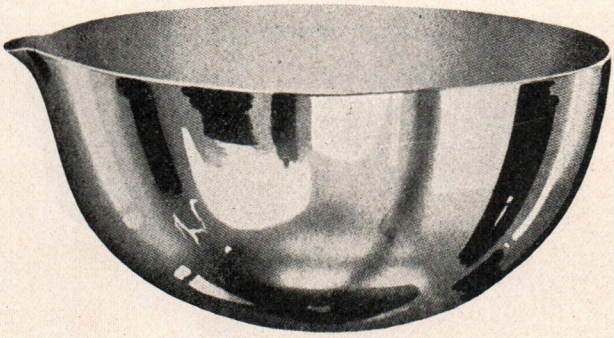
Capacity	24 cc.	Weight of Crucible	18.0 grams
Diameter of Top	3.6 cm.	Weight of Special Cover	8.0 grams
Diameter of Bottom	1.5 cm.	Weight, total	26.0 grams
Height	4.5 cm.	Capacity of Special Cover	10.0 cc.

The wedge shaped, tight fitting cover makes this pattern crucible especially adapted to the J. Lawrence Smith fusion for alkali, where loss by volatization is particularly to be avoided. The conical shape of the crucible allows the fusion mixture to settle down with the upper layer always close to the walls. Set in a piece of asbestos board the bottom half may be heated full red without any danger of volatilization of alkali chlorides. For ordinary fusions the slanting sides are of special advantage because of the more direct transmission of the heat. None of the fusion mixture ever remains unmelted and clinging to the walls of the crucible. The crucible may be protected within a clay cylinder and from any position the cover may be lifted with the tongs. The cover may be used as a separate dish and is especially to be recommended for the ignition of precipitates in the electric muffle. Heat from the Bunsen burner does not tarnish this metal nor does a sodium carbonate fusion leave a visable stain on the inside walls.

The weights listed are approximate.

Prices on application.

DISHES



No. 4447A

PALAU ROUND BOTTOM DISHES—Hammered and Guaranteed

Supplied with or without lips.

Number	4447A	4447B	4447C	4447D	4447E	4447F	4447H
Capacity	15	20	25	35	50	65	75 cc.
Diameter	3.9	4.3	4.5	4.8	5.6	6.2	6.7 cm.
Depth	1.9	2.0	2.2	2.4	2.8	3.0	3.3 cm.
Approximate weight	5.0	6.0	8.0	10.0	14.0	18.0	20.0 grams

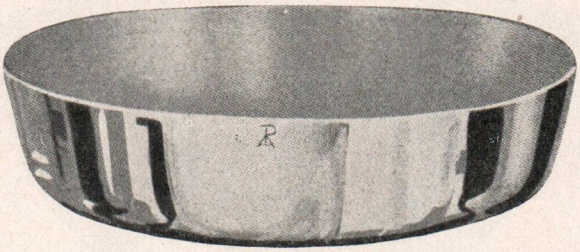
Number	4447I	4447J	4447K	4447L	4447M	4447 N
Capacity	100	125	150	175	200	250 cc.
Diameter	7.1	7.7	8.3	8.8	9.3	10.0 cm.
Depth	3.6	3.8	4.0	4.2	4.4	4.7 cm.
Approximate Weight	27.0	34.0	40.0	44.0	54.0	64.0 grams

Dishes of special design and weights made to order.

Prices on application.

DISHES

WATER ANALYSIS

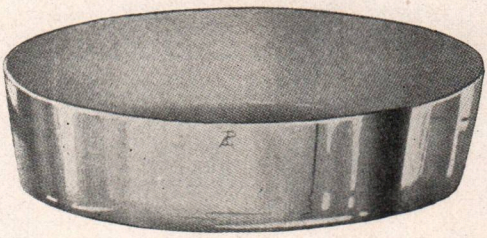


No. 4448A

Capacity 100 cc.

Diameter of Top cm.	Diameter of Bottom cm.	Depth cm.	Weight (Approx.) grams
8.5	7.5	2.0	20.0

MILK ANALYSIS



No. 4448B

Capacity 50 cc.

Diameter of Top cm.	Diameter of Bottom cm.	Depth cm.	Weight (Approx.) grams
7.0	6.5	1.5	15.0

Prices on application.

DISHES

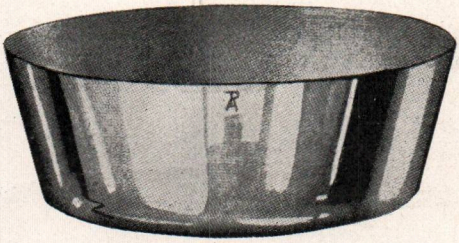
SUGAR ANALYSIS

No. 4449A

Hammered and Guaranteed.

Number	4449A	4449B
Capacity	20	30 cc.
Diameter	4.3	4.6 cm.
Depth	2.1	2.3 cm.
Weight (approx.)	10.0	15.0 grams

COPPER SLAG ANALYSIS



No. 4449C

Capacity 45 cc.

Diameter of Top cm.	Diameter of Bottom cm.	Depth cm.	Weight (Approx.) grams
6	5	2	17

These dishes are used in decomposing copper slag and ores, by means of hydrofluoric acid, and to decompose samples by fusing with sodium carbonate.

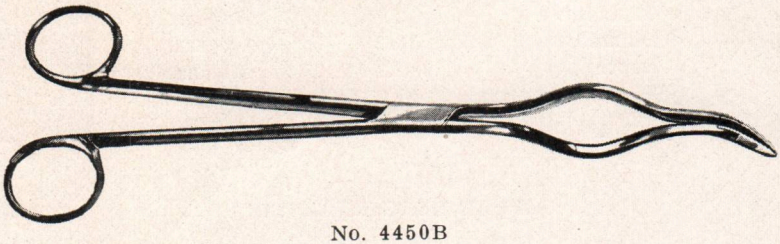
Prices on application.

FORCEPS

No. 4450A

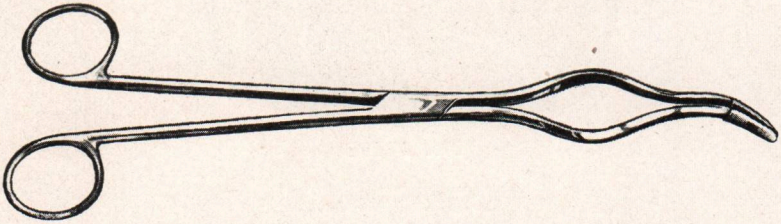
4450A Nickel-plated Forceps, approximately 5¾ inches long, complete with PALAU tips .....each .....

CRUCIBLE TONGS



No. 4450B

4450B Nickel-plated Tongs, approximately 8 inches long, complete with solid PALAU tips .....each .....

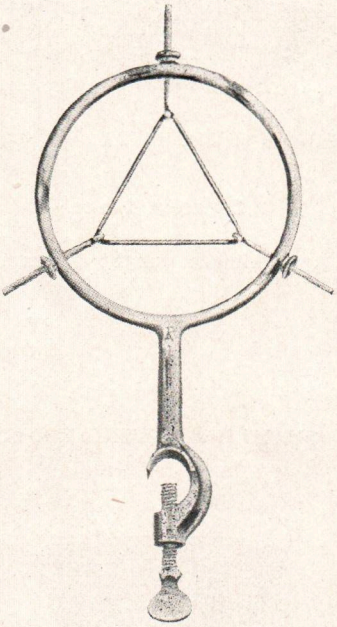


No. 4450C

4450C Hollow PALAU Sleeves with reinforced ends for Crucible Tongs. Sleeves only, per pair .....

Price on application.

TRIANGLES



No. 4451A

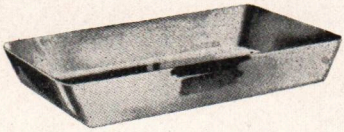
4451A PALAU Triangles are made of heavy wire in one style only, and are intended for use with special triangle holder as illustrated.

Crucible contents	10	15	20	25	30	40	50	60	cc.
Weight, (approx.)	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	grams

4451B TRIANGLE HOLDER—This holder is nickel-plated and has a clamp for attaching to support; is adjustable, and will accommodate triangles for holding various sized crucibles.

Price on application.

PALAU INCINERATING PAN

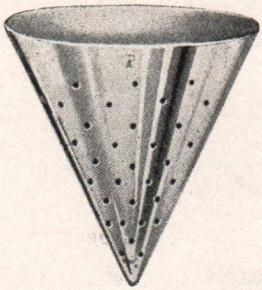


No. 4452A

Capacity 16 cc.

Approximate weight 9 grams.

SEAMLESS FILTER CONES



No. 4452B

PALAU Filter Cones are made with 60° angle.

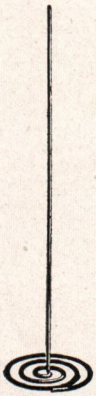
Standard size perforations.

Diameter	¾	⅞	1	1¼	1½	inches
Weight (approximate)	1.0	1.5	2.0	3.0	5.0	grams

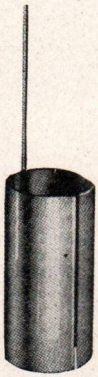
Prices on application.

ANODES AND CATHODES

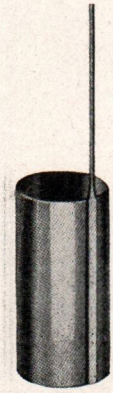
No. 4453A



No. 4453B



No. 4453C



No. 4453D

4453A **PAULA ANODE** for electrolytic separation. Spiral form ⅝ inch diameter, 6½ turns. Weighs approximately 7 grams, and is a standard form.

4453B **PALAU ANODE,** made to order in any size or shape.

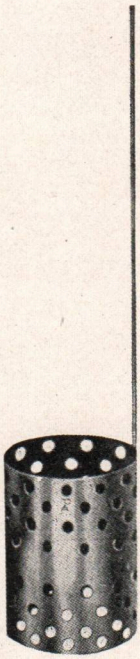
4453C **PALAU CATHODE** for electrolytic separation, open cylinder type.

Diameter of Cylinder	1 inch
Height of Cylinder	2 inch
Height of Stem	2 inch
Height, over all	4 inch
Diameter of Stem	.040 inch
Weight, approximate	11 grams

4453D **PALAU CATHODE** for electrolytic separation, closed cylinder type.
Dimensions and weight the same as shown under 4453C.
Palau Cathodes have welded joints and seams.
Special styles and sizes made according to specifications.
Prices on application.

ANODES AND CATHODES

No. 4454A



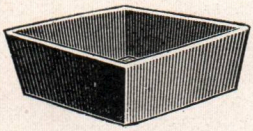
No. 4454B

4454A **PALAU ANODE,** rotating type, made of heavy wire with special loop and intended especially for use with the Braun Rotating Electrolytic Outfit. Weighs approximately 5 grams.

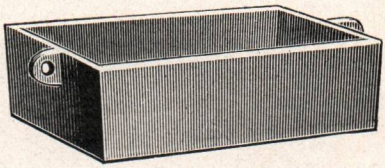
4454B **PALAU CATHODE,** made of perforated Palau ware of sufficient thickness to withstand rough usage, and intended especially for use with the Braun Rotating Electrolytic Outfit. Weighs approximately 12 grams.

Prices on application.

PANS—PAPER



No. 4455A



No. 4455B

4455A **PANS.** Of cast iron, for drying and roasting ores. Size, 6x6x2¼ inches deep, each $0.50

4455B **PANS.** Of cast iron, with 2 handles, for drying slimes of precipitates, size, 18x12x6 inches, each 5.00

4455C **PANS, SAMPLING.** See Sampling Pans, page 355, Nos. 3194-3196.

4455D **PAPER, GLAZED.** White, 20x24 inches. Per quire ..... .75

4455E **PAPER, GLAZED.** Black. 20x24 inches. Per quire ..... .75

4455F **PAPER, GLAZED.** Blue. 20x24 inches. Per quire ..... .75

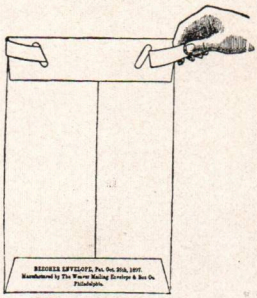
4455G **PAPER, GLAZED.** Yellow, 20x24 inches. Per quire ..... .75

4455H **PAPER, PARCHMENT.** For dialysers, etc. Per lb. ..... .65

PAPER, BOTANICAL. See Botanical Drying Paper.

PAPER TESTER. See Testing Machines.

PAPER LETMUS AND TURMERIC. See Test Paper.



No. 4455J

4455I **PAPER BAGS.** Manila, for ore samples, size 4½x7 inches. Per 1000 ..... $3.50

4455J **PAPER MAILING ENVELOPES.** For ore samples.

Capacity ..... oz.	1	2	4	6	8
Size ..... in.	3x5	3½x6	4x7	4½x8	5x9
Per 100	$0.60	.80	1.00	1.20	1.50

4455K **PAPER ORE BAG.** Excelsior, for mailing; 3½x5 inches when closed. Is folded and gummed in such a way that when sealed it is absolutely tight. Especially adapted for mailing finely ground ore samples or powdered substances. Per 1000 ..... 3.50

4455L **PENCIL GREASE,** for writing on glass and porcelain. Red, blue black or yellow, each ..... .25

PENCILS

No. 4456A

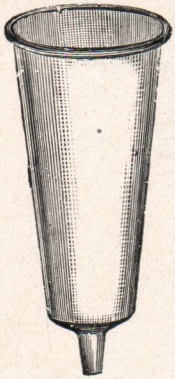
4456A **PENCILS, LITMUS.** One end red and one end blue litmus pencil. Each $0.75

4456B **PENCILS, WAX.** Blue. For writing on glass, china, metal, etc. Each ..... .30

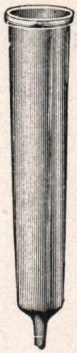
4456C **PENCILS, WAX.** Red. For writing on glass, china, metal, etc. Each ..... .30

4456D **PENCILS, WAX.** Yellow. For writing on glass, china, metal, etc. Each ..... .30

PERCOLATORS



No. 4456E



No. 4456G

4456E **PERCOLATORS, GLASS.** Conical shape. Type 8345.

Capacity, pints	1	2	4	8
Each	$0.47	.58	.94	1.46

4456F **PERCOLATORS, GLASS.** Blown, conical shape. Type 8350.

Capacity, gallons	2	3	5
Each	$3.90	6.53	12.60

4456G **PERCOLATORS, OLDBERG'S.** Glass cylindrical shape. Type 8355.

Capacity, pints	1	2	4	8
Each	$0.90	1.15	1.90	2.90

RINCHCOCKS, MOHR'S. See Clamps.

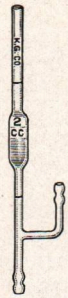
PICKS, PROSPECTING. See Hammers.

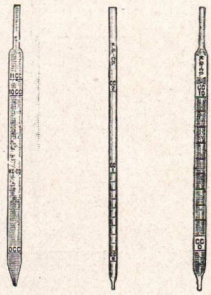
PIPETTES

No. 4457B

No. 4457C

No. 4457D


No. 4457E


No. 4457F

4457A **PIPETTE, DROPPING.** Straight, drawn to point, without rubber bulb. Type 8375.

Length, inches	6	7	8	10	12	15	18
Dozen	$0.60	.60	.72	.75	.96	1.20	1.50

4457B **PIPETTES, DROPPING.** Fitted with white or black rubber bulb, either straight or curved. Type 8380.

Dozen	$0.25
Gross	2.80

4457C **PIPETTES, DROPPING.** Automatic, with rubber bulb; used for filling Ampoules. Capacity, 1 cc. Type 8385. Each 1.58

4457D **PIPETTES, OVERFLOW.** Automatic, with three-way stopcock and reservoir for collecting excess. Type 8390.

Capacity, cc.	10	15	25	50	100
Each	$4.00	4.50	5.00	5.50	6.50

4457E **PIPETTES, OSTWALD'S.** For calibrating 2 cc., with two marks. Type 8395. Each $1.10

4457F **PIPETTES, GRADUATED.** Designed for use in water analysis as used by the Hygienic Laboratory of the U. S. Public Health Service. The 11 cc. pipette has mark at 0-10 and 11 cc. only. The 10 cc. pipette is graduated from 0 to 10 cc. in single cc. The 2 cc. pipette is graduated from 0 to 1 cc. in 1/10ths, and plain from 1 cc. to 2 cc. Type 8400.

Capacity, cc.	2	10	11
Each	$0.40	.40	.40

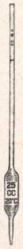
PIPETTES

No. 4458A

No. 4458B

No. 4458C

No. 4458D


No. 4458E

No. 4458F

4458A **PIPETTES, VOLUMETRIC.** With bulb in middle of tube, accurately graduated. Type 8405.
Type 8410.

Capacity, cc.	1	2	3	4	5	10	15
Each	$0,15	.15	.15	.15	.15	.17	.24
Capacity, cc.		20	25	50	75	100	200
Each		$0.26	.28	.35	.45	.50	.60

4458B **PIPETTES, SEROLOGICAL.** Graduation extended to extreme tip.

Capacity, cc.	1/10	1	1	1	2	2	2
Graduated into	1/100	1/10	1/50	1/100	1/10	1/20	1/50
Each	$0.35	.35	.40	.45	.35	.40	.45
Capacity, cc.		5	5	10	10	25	50
Graduated into		1/10	1/20	1/10	1/20	1/10	1/10
Each		$0.40	.45	.45	.50	.60	1.00

4458C **PIPETTES, MOHR'S.** Accurately graduated in cubic centimeters and fractions thereof. Type 8415.

Capacity, cc.	1/10	1	1	1	2	2	2
Graduated into	1/100	1/10	1/50	1/100	1/10	1/20	1/50
Each	$0.35	.35	.40	.45	.35	.40	.45
Capacity, cc.		5	5	10	10	.25	.50
Graduated into		1/10	1/20	1/10	1/20	1/10	1/10
Each		$0.40	.45	.45	.50	.60	1.00

4458D **PIPETTES, MOHR'S.** Graduated, with glass stopcock. Type 8420.

Capacity, cc.	10	25	50	100
Graduated into	1/10	1/10	1/10	1/10
Each	$1.60	1.80	2.00	2.50

4458E **PIPETTES, VOLUMETRIC.** Short form, accurately graduated. Type 8425.

Capacity, cc.	1	2	5	10	20	25	50
Each	$0.15	.15	.15	.17	.26	.28	.35

4458F **PIPETTES, VOLUMETRIC.** Without bulb, as used in bacteriological work, water analysis, etc. Type 8430.

Capacity, cc.	1	2	3	4	5	10
Each	$0.15	.15	.15	.15	.15	.17

No. 4458G

No. 4458I

4458G **PIPETTES, ASSAY TON.** 29.166 cc. ..... each $0.75
4458H **PIPETTES, SUCROSE.** 52.096 cc. ..... each 2.25
4458I **PIPETTE RESTS.** Of porcelain, fluted ..... each .75

NOTES UPON THE USE AND CARE OF PLATINUM WARE

No. 4459A

It is important to remember that, although platinum is not oxidized in the air at any temperature, nor attacked by any single acid, yet there are many substances that attack and combine it at comparatively low temperatures

The caustic alkalies, the alkaline earths, nitrates and cyanides, and especially the hydrates of barium and lithium, attack platinum at a red heat, although the alkaline carbonates have no effect at the highest temperatures. Sulphur in the absence of alkalies, has no action, but phosphorous and arsenic attack platinum when heated with it.

Direct contact of platinum with burning charcoal should be avoided, since the silicon reduced from the charcoal ash unites platinum, making it brittle and liable to fracture.

Also contact with compounds of the easily reducible metals is especially dangerous at high temperatures, as alloys with platinum having a low fusing point are readily formed. This is especially true of lead.

Heating of platinum with spirit lamps is preferable to the use of ordinary gas. When gas is used, care should be taken to have the supply of air sufficient to insure complete combustion, since, with the flame containing free carbon, the platinum suffers deterioration by the formation of a carbide of platinum, which, oxidizing later, blisters the metal. For this reason, also, the inner cone or reducing flame should not be in contact with the metal.

The loosening effect of the Bunsen flame upon the surface of platinum exposed to its action produces the familiar gray appearance which can not be removed except by burnishing. Platinum triangles often become gray and very brittle from the same cause. Systematic application of moist sand to all articles affected in this way, after use, will keep them in prime condition and materially prolong their life, with but a trifling loss in weight.

CLEANING PLATINUM WARE

No. 4460A

Every careful analyst of necessity uses clean utensils. A habit of cleaning and polishing platinum dishes immediately after using is easily formed, and repays the user with increased confidence in his work as well as in the prolonged life of the article.

Rubbing the surface of platinum with moist sea sand (round grains only), applied with the fingers, serves to remove most impurities and to polish the metal without material loss.

Fusing bisulphate of potash or borax in the dish and then boiling in water and polishing as above with sand is recommended by Gmelin. When it is desired to clean the outer surface of dishes in this manner, they must be placed in dishes of sufficient size to allow the fused flux to completely envelope the article to be cleaned.

Sodium amalgam possesses the property of wetting platinum without amalgamating with it, even when other metals are purposely added to the amalgam. This substance is, therefore, useful for effecting a quick and thorough cleasing of platinum. The amalgam is gently rubbed upon the metal with a cloth and then moistened with water, which oxidizes the sodium and leaves the mercury free to alloy with foreign metals. The mercury is then wiped off and the dish cleaned and polished with sand, as above described.

If the existence of a base metal alloyed with the platinum is suspected, immerse the article in question first in boiling HCl for a few minutes, then, after thorough rinsing with clean water, immerse in boiling HNO_3 acid free from chlorine.

If the dish is unaffected in weight or appearance, and the acid baths fail to give reaction for the base metals, their absence in appreciable quantities is assured.

We handle only the Platinum Ware of the best manufacturers.

The purity is guaranteeed and the shapes are of the latest designs.

The Crucibles and Dishes are hammered. Special apparatus is made to order.

Weights given are approximate only.

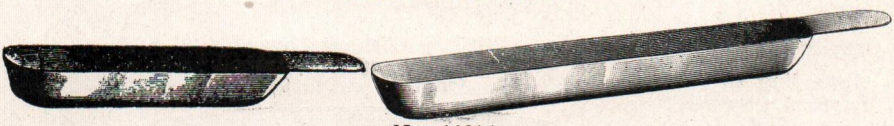
List prices are not given on account of the fluctuation in the market, but our quotations are in accord with the lowest market prices.

Quotations are for immediate acceptance only.

Old or scrap Platinum bought or taken in exchange.

PLATINUM

COMBUSTION BOATS



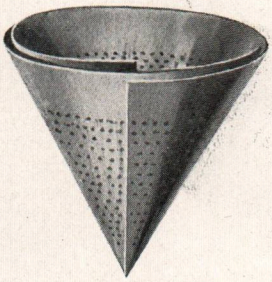
No. 4461A

		Approximate Wt., Grammes
4461A ½-inch wide x ⅜-inch deep	1½ inches long	2.8
	2 inches long	3.6
	3 inches long	5.8
	3¾ inches long	6.3

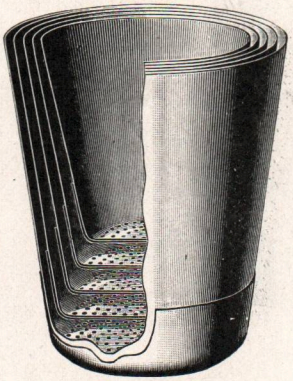
Other sizes and shapes made to order. Sold by the piece.

Gooch Form Crucible

Seamless Platinum Filter Cone



No. 4461B



No. 4461C

SEAMLESS PLATINUM FILTER CONES

Coarse or fine perforation. Covers are always furnished with crucibles unless otherwise ordered. Gooch Crucibles of other capacities, made to order.

Diameter ....inches	¾	⅞	1	1¼	1½	1¾	2
Approx. weight....grammes	1	1.5	2 1	3.1	5.3	7.5	9.2

PLATINUM CRUCIBLES, GOOCH FORM, WITH OR WITHOUT COVERS

4461C **PLATINUM CRUCIBLES, GOOCH FORM.** With covers and caps, weigh as follows:

Capacity ....cc.	10	15	20	25	30
Approx. weight ....grammes	13	18	22	29	34
Diameter and depth....cm.	2.7	3.2	3.3	3.6	3.9

Coarse or fine perforation. Covers are always furnished with crcibles unless otherwise ordered. Gooch Crucibles of other capacities, made to order.

In ordering new crucible covers, please specify the inner diameter of top of your crucibles. This is important, since crucibles of the same capacity of different makes frequently vary considerably in pattern.

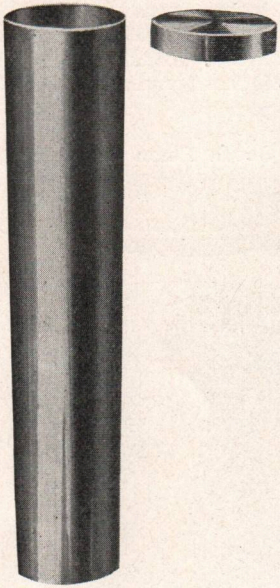
Prices on application.

PLATINUM

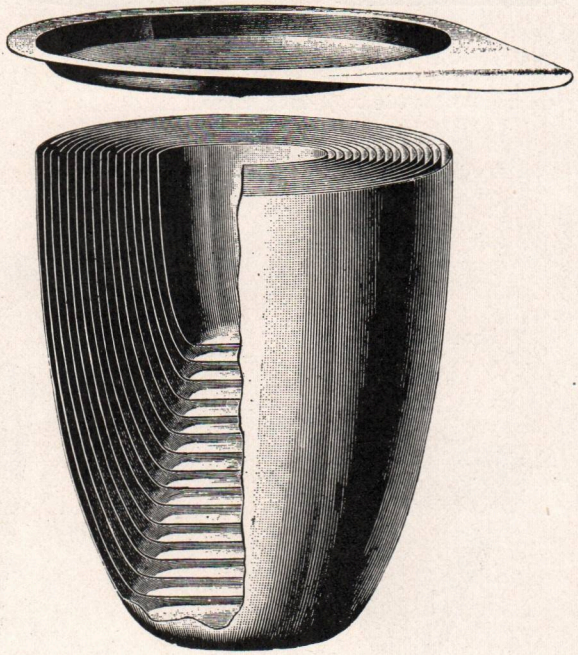
CRUCIBLES

With or Without Covers
Hammered and Guaranteed
(Full Size from 10 cc. to 90 cc., Inc.)

According to J. Lawrence Smith for Alkali Determination



No. 4462A



No. 4462B

4462A **PLATINUM CRUCIBLES.** According to J. Lawrench Smith. For alkali determination. 8.0 cm. high. 1.8 cm. top diameter. Weight, 35 grammes, including cover.

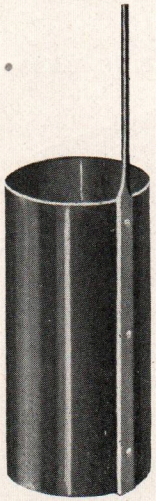
4462B **PLATINUM CRUCIBLES.** With or without covers. Hammered and guaranteed. Platinum crucibles with covers weigh approximately as many grammes they hold cubic centimeters, as follows:

Capacity .....cc.	8	10	15	20	25	30	40
Approx. weight....grammes	8	10	15	20	25	30	40
Diam. and depth.....cm.	2.2	2.5	3.0	3.3	3.5	4.0	4.2
Capacity cc	50	60	70	80	90	100	110
Approx. weight....grammes	50	62	65	68	70	80	90
Diam. and depth.....cm.	4.4	4.7	5.0	5.3	5.4	5.6	5.7

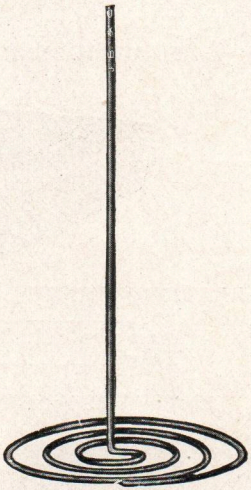
Covers are always furnished with crucibles, unless otherwise ordered. Crucibles of other weights are capacities made to order. Gold, silver and gold-lined platinum crucibles made to order.

Prices on application.

PLATINUM

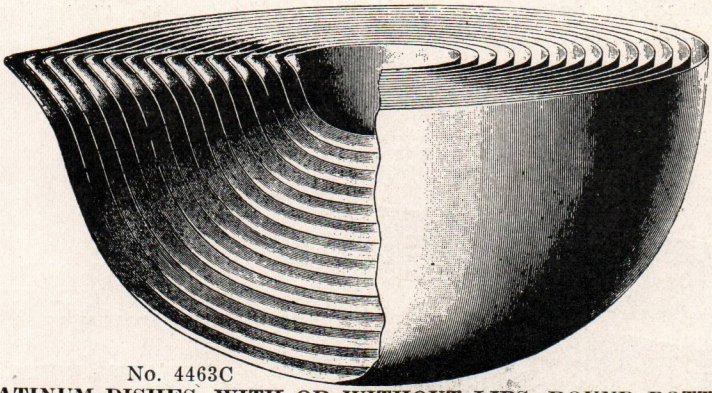


No. 4463A
Closed Cylinder



No. 4463B
Spiral

4463A **PLATINUM CYLINDER AND SPIRAL.** For quantitive determination of copper by electrolysis, cylinder 2x1 inches, weight, about, 20 grammes.



No. 4463C

PLATINUM DISHES, WITH OR WITHOUT LIPS, ROUND BOTTOM

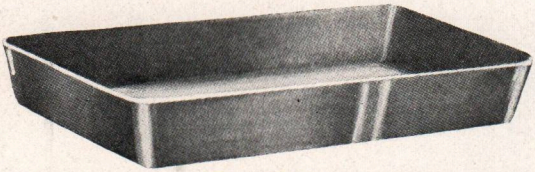
4463C Other sizes, shapes and weights, or with wired rims made to order. Platinum dishes weigh approximately one-third as many grammes as their capacity in cubic centimeters.

Capacity	cc.	15	20	25	35	50	65	75	100
Approx. wt.	gms.	5	6	8	12	17	22	25	33
Diameter	cm.	3.8	4.2	4.4	4.8	5.6	6 5	6.5	7.2
Depth	cm.	1.0	2.0	2.2	2.4	2.7	3.0	3.3	3.5
Capacity	cc.	125	150	175	200	250	300	350	400
Approx. wt.	gms.	42	50	55	67	80	94	117	133
Diameter	cm.	7.8	8.4	8.9	9.4	9.8	10.4	11.1	11.5
Depth	cm.	3.7	3.7	4.1	4.3	4.5	4.8	5.0	5.4

Gold, gold-lined or silver dishes made to order.
Prices on application.

PLATINUM

HAMMERED PLATINUM INCINERATING PANS

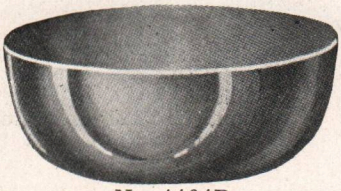


No. 4464A

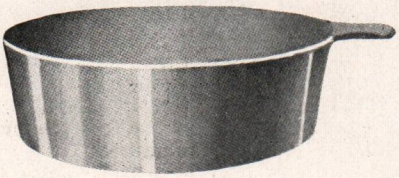
4464A **PLATINUM DISHES.** For incineration of filters, square.

No.		1	2
Diameter	inches	1½	2
Weight	grammes	10	20

PLATINUM WARE FOR MILK AND SUGAR ANALYSIS



No. 4464B



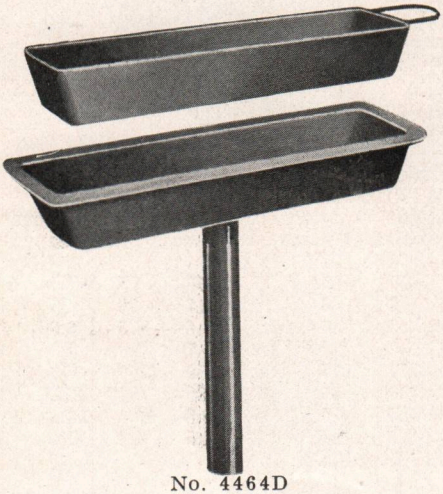
No. 4464C

4464B **PLATINUM DISH.** For milk analysis, hammered and guaranteed. Capacity, 45 cc. Approximate weight, 17 grammes.

4464C **PLATINUM INCINERATING PAN.** For sugar analysis, with or without lip or handle.

Capacity	cc.	10	20	25	35
Approximate weight	grammes	10	14	18	20

Illustration shows full size of 20 cc. dish.



No. 4464D

PLATINUM BOAT AND HOLDER FOR IRON AND STEEL ANALYSIS

BLAIR'S FORM

4464D Approximate weight of boat and holder, 19 grammes. Other sizes and patterns, to order.

4464E **PLATINUM FOIL.**

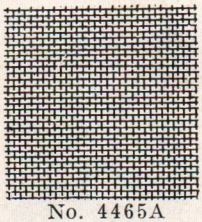
Style	Light	Med.	Heavy
Thickness, ins.	1-1000	1-500	1-250
Weight per sq. in., grammes	.353	.705	1.411

Prices on application.

PLATINUM

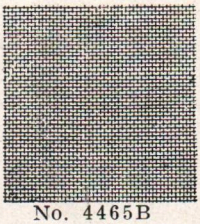
PLATINUM GAUZE

45 Mesh



No. 4465A

52 Mesh



No. 4465B

4465A **PLATINUM GAUZE.** 45 Mesh, 1.5 grammes to sq. in.; 52 Mesh .55 grammes to sq. in.

SPATULAS

5 Grammes

No. 4465D

8 Grammes

No. 4465C

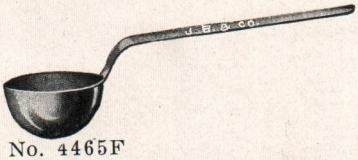
4465C **PLATINUM SPATULAS.** Stock sizes as illustrated, weight 5 and 8 grammes. Spatulas all shapes, weights and sizes, made to order.

No. 4465E

4465E **PLATINUM SPONGES.** Wired for Hydrogen Ignition.

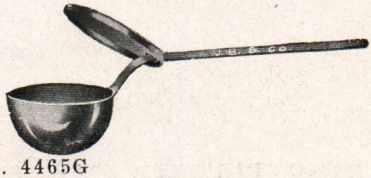
DEFLAGRATION SPOONS

Without Cover



No. 4465F

With Cover



No. 4465G

4465F **PLATINUH DEFLAGRATION SPOONS.**

Diameter of Bowl	inches	3/8	1/2	3/4
Approximate Weight	grammes	2.4	3.5	6.5

No. 4465H

No. 4465I

No. 4465J

4465H **PLATINUM TIPS FOR BLOW PIPES.**

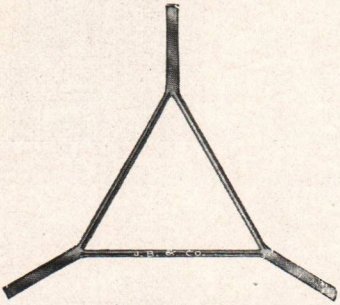
4465J **PLATINUM PENS,** of Platinum Iridium for writing with Hydrofluoric Acid.

Prices on aplication.

Approzimate Weight	grammes	2. 4	3.5	6.5

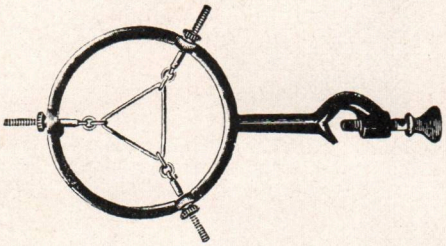
TRIANGLES

Solid Ends



No. 4466A

Plain, Without Ends



No. 4466B

4466A **PLATINUM TRIANGLES.** Solid ends. Approximate weights of platinum triangles with solid ends, as follows:

Size of wire	inches	.045	.045	.055	.055	.064	.064
Crucible contents	cc.	10	15	.20	.30	.40	.60
Weight	grammes	5	8	11	12	15	18

4466B **PLATINUM TRIANGLES.** Plain, without ends.

Crucible contents	cc.	10	15	20	25	30	60	80
Sides	inches	1½	1⅝	1¾	2	2¼	2½	3
Weight	grammes	2½	3	4	4½	5	8	10

Adjustable nickel-plated triangle holders supplied, suitable for plain triangles.

No. 4466D

4466C **PLATINUM WIRE.** Sizes according to Brown & Sharpe gauge.

No.	12	14	16	18	20	22	24
Size, decimal of in.	.0808	.0641	.0508	.0403	.0320	.0253	.0201
Weight, per in. lbs.	1.8	1.1	.7	.45	.28	.17	.12
No.	26	27	30	34	35	36	
Size, decimal of in.	.0159	.0142	.0100	.0063	.0056	.0050	
Weight, per in. lbs.	.85	.65	.33	.132	.101	.08	

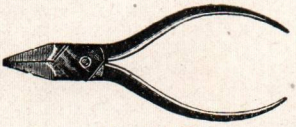
4466D **PLATINUM WIRE HOLDERS** ..... each .....

PLATINUM ANODES and CATHODES. For Guess-Haultian Electrolytic Apparatus. See Electrolytic Apparatus section.

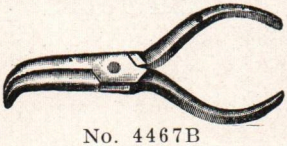
PLATINUM FORCEPS. See Forceps.

PLATINUM TONGS. See Tongs.

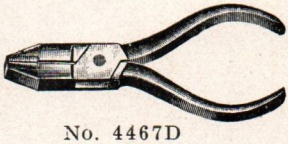
PLIERS, NIPPERS AND POTASH BULBS



No. 4467A



No. 4467B

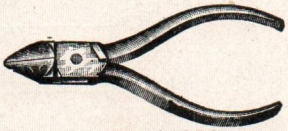


No. 4467D

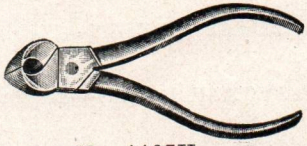
4467A **PLIERS,** "Button." Straight nose for holding buttons while brushing, size, 5 inches $0.50
4467B **PLIERS,** "Button." Curved nose, 5-inch ..... .75
4467C **PLIERS,** "Button." Curved nose, 5-inch, fine point ..... .50
4467D **PLIERS,** Flat Nose. Steel faced, 6-inch, side cutting ..... .75

No. 4467E

4467E **PLIERS,** Gas. Length, 8 inches 1.25
4467F **POKERS,** Iron. For furnaces 1.25



No. 4467G



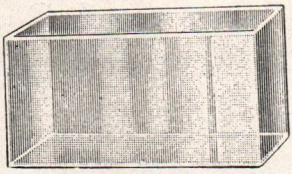
No. 4467H

4467G **NIPPERS,** Side Cutting

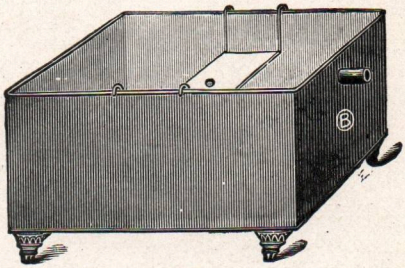
Length	inches	5	6
Each		$1.50	2.00

4467H **Nippers,** End Cutting

Length	inches	5	6
Each		$1.50	2.00



No. 4467I



No. 4467J

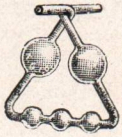
4467I **TROUGHS, Glass.** With ground off rims.

Length ..... inches	8	10	12	
Width ..... inches	4	6	8	
Height ..... inches	4	5	6	
Each	$3.00	4.00	6.00	

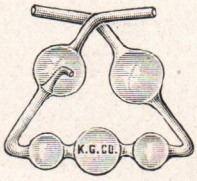
4467J **TROUGHS,** Pneumatic. Japanned zinc, with sliding shelf and overflow.

Size ..... inches	5x7x10	5x9x12	6x11x15	8x12x18
Each	$1.75	2.25	2.50	3.25

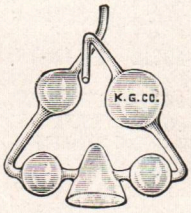
POTASH BULBS



No. 4468A



No. 4468B

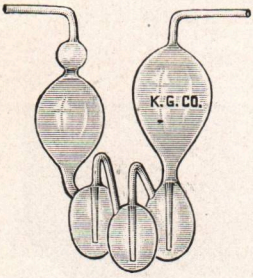


No. 4468C

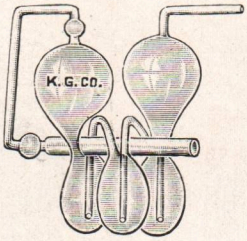
4468A **POTASH BULBS**—Liebig's; with five bulbs. Type 8435, each..$1.50

4468B **POTASH BULBS**—Liebig's; Dittmar. Type 8440, each..... 2.00

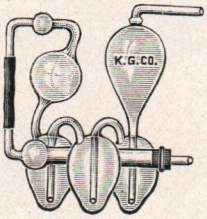
4468C **POTASH BULBS**—Liebig's; Kyll. Type 8445, each..... 2.00



No. 4468D



No. 4468E



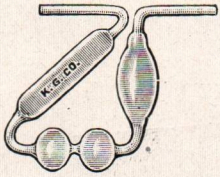
No. 4468F

4468D **POTASH BULBS**—Mohr's. Type 8450, each..... 2.50

4468E **POTASH BULBS**—Mohr's; with $CaCl^2$ tube. Type 8435, each.... 3.00

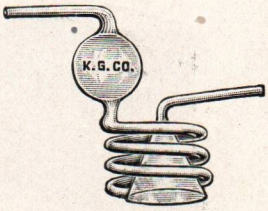
4468F **POTASH BULBS**—Mohr's; with $CaCl^2$ tube and rubber connections. Type 8460, each 3.50

POTASH BULBS



No. 4469A

No. 4469B

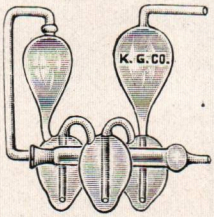


No. 4469C

4469A **POTASH BULBS**—Mohr's. Type 8480, each ..... ----

4469B **POTASH BULBS**—Mohr's; with $CaCl^2$ tube. Type 8485 ,each.... ----

4469C **POTASH BULBS**—Mohr's; with $CaCl^2$ tube and rubber connections. Type 8490, each ..... ----



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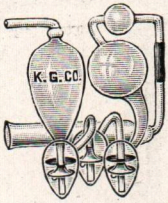

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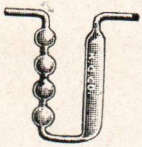


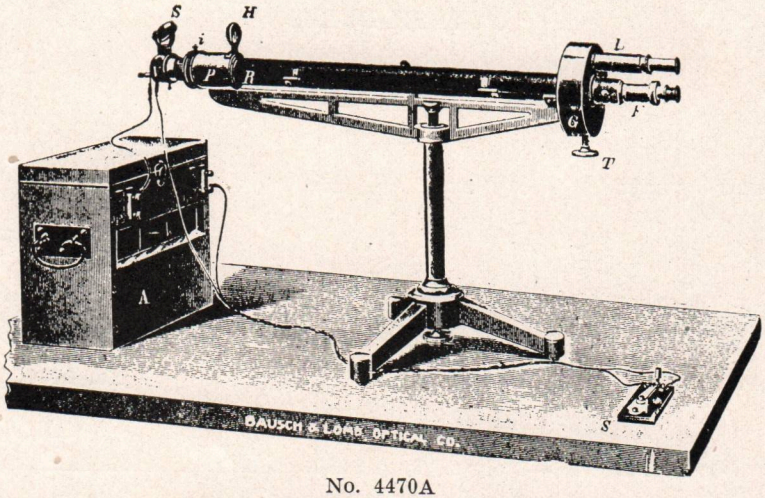
No. 4469F

4469D **POTASH BULBS**—Mohr's; with $CaCl^2$ tube ground in. Type 8465, each $3.50

4469E **POTASH BULBS**—Geissler, Wetzel; with a ball float valve in each of the lower bulbs. Type 8470, each 5.00

4469F **POTASH BULBS**—Mitcherling's. Type 8475, each..... 1.00

POLARISCOPES

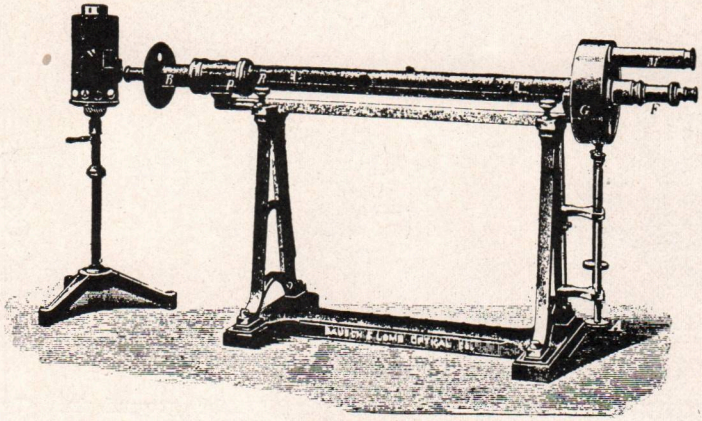


No. 4470A

SCHMIDT HAENSCH POLARISCOPES

These polariscopes are constructed similarly to that above, differing only in the compensating wedge, which is single in these instruments.

4470A With single wedge compensation and triple field of vision, complete, with one each 100-mm. and 200-mm. tubes, mounted on trestle support and including folding glass case, but no source of illumination ....



No. 4470B

NOT REQUIRING MONOCHROMATIC LIGHT

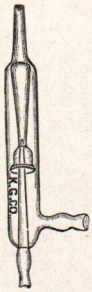
This is the latest improved type of polariscope or saccharimeter for the sugar laboratory. Readings give the per cent of sugar direct.

4470B Half shade with double wedged compensation and triple field of vision, complete, including one 100-mm. and one 200-mm tube without lamp, mounted on trestle support, including folding glass case ....

Prices on Polariscopes will be furnished on request.

PUMPS

No. 4471A



No. 4471B

No. 4471C

4471A **PUMPS—FILTER,** Geissler's; of glass. Type 8493, each.....$ 1.20

4471B **PUMPS—FILTER,** Muencke's; of glass, with one suction tube. Type 8500, each 1.85

4471C **PUMPS—FILTER,** Muencke's; of glass, with two suction tubes. Type 8505, each 2.25

4471D **REDUCTOR—**Blair's; for the determination of phosphorous in steel by the reduction of the solution by filtration through zinc. Tube only, with glass stopcock. Type 8510 ,each.... 3.00

No. 4471D

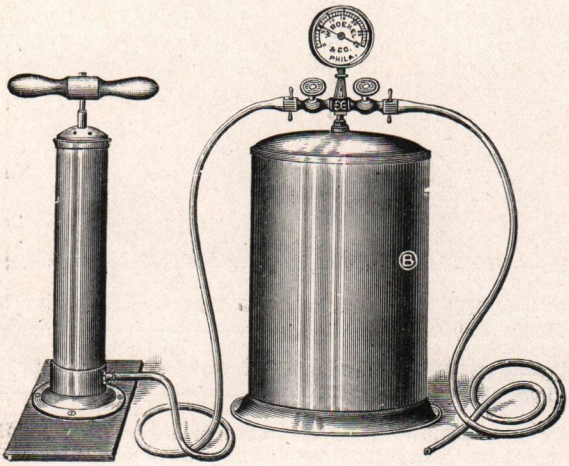
No. 4471E

4471E **SOIL SEPARATOR—**Brogger's, Harada's; a stoppered funnel with two stopcocks, bore of upper stopcock 10 m/m. Type 8515, each..... 12.00

4471F **SOIL SEPARATOR—**Brogger's, Harada's; same as Type 8515; bore of upper stopcock, 15 m/m. Type 8520..... 14.00

PUMPS

SMALL SIZE, TWO OUTLETS



No. 4472A

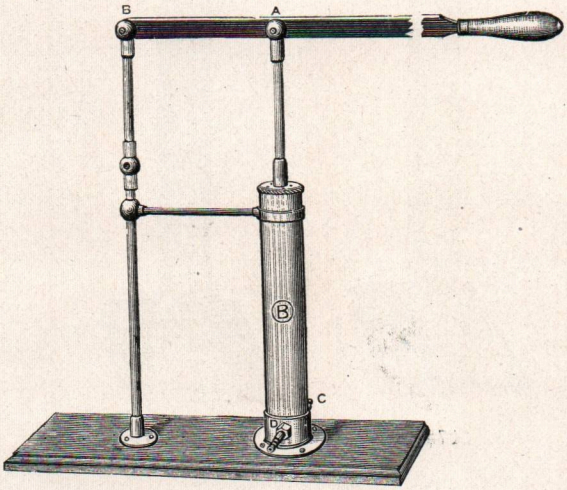
THE AIR RECEIVER is 13 inches high and 8 inches diameter, the extreme height from base to top of gauge being 18½ inches. It is thoroughly tested to 100 pounds hydraulic pressure and warranted to be air-tight and to **stand the maximum pressure of 50 pounds.**

The pump is 15 inches high and the chamber 10½ inches long by 2⅛ inches diameter. Both Receiver and Pump are well made in every respect, highly polished and nickel-plated.

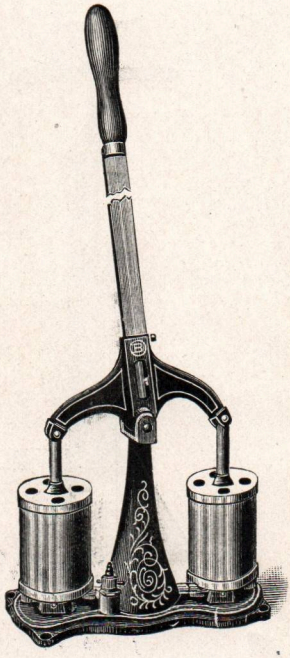
4472A Type 375. **AIR RECEIVER AND PUMP** complete, including 8 feet silk-covered Rubber Tubing. Each.....$30.00

4472B Type 378. **AIR RECEIVER WITH TUBING,** no pump, each..... 25.00

PUMPS



No. 4473A



No. 4473B

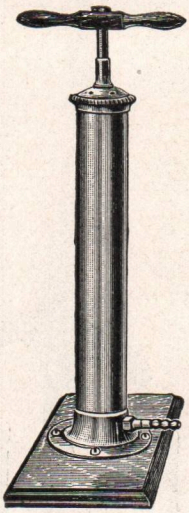
4473A Type 530. **PUMP WITH LEVER HANDLE,** for pressure. On account of the lever handle, this pump is more powerful than the Tee Pump and a greater pressure can be obtained by it. It is provided with a patented valve which increases its efficiency; size, 22½ inches high, chamber 12½ inches by 2⅛ inches diameter, the handle or lever being 27 inches long. The Pump is highly polished and nickel-plated and attached to an oak base. Each $19.00

4473B Type 535. **PUMP WITH LEVER HANDLE.**—Same as above but Vacuum and pressure. Each 25.00

4473C Type 540. **DOUBLE CYLINDER PUMP** is thoroughly well made of heavy material, making it more durable than other makes. It is of improved construction, as the air tube connecting the two cylinders extends through the upright, not only protecting the tubing, but, making it almost invisible. The Cylinders are made of extra heavy brass, size 3½ by 5 inches, being polished and nickel-plated. The iron parts are japanned in black and ornamented. Each.. 30.00

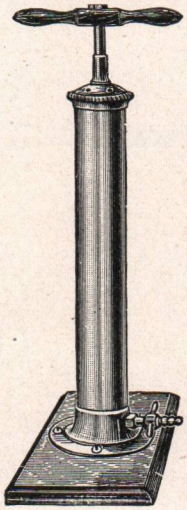
PUMPS

Pressure



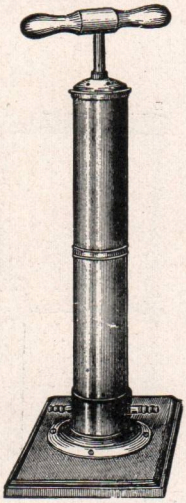
No. 4474A

Pressure



No. 4474B

Vacuum and Pressure



No. 4474C

OUR AIR PUMPS are thoroughly well made of heavy material and provided with patented valves, which increase their efficiency. They are highly polished and nickel-plated.

4474A Type 560. **PUMP,** 21½ inches high, the chamber 16 inches long by 2⅛ inches diameter. It is mounted on an oak base. Each ..... $ 9.00

4474B Type 565. **PUMP,** the same as above, with the exception of having a **Coupling with nipple attachment** for the tubing, and the base and handle being of **ebony finish,** which adds greatly to the appearance of the Pump. Each 10.00

4474C Type 570. **PUMP,** for **vacuum and pressure.** This Pump is the same as our Type 560, but with two valvel and two nipples, for in and outlet of air. Each 12.00

FERY RADIATION PYROMETER

PORTABLE OUTFIT

No. 4475A

Indicating Outfit, comprising Féry patent pyrometer telescope, standard thermocouple type, with adjustable diaphragm, collapsible tripod, portable indicator calibrated to read temperatures direct over two standard scale ranges, calibrated also in millivolts; flexible cable 15 feet long, with attachment tangs; traveling case with handle, lock and key, and full instructions for use.

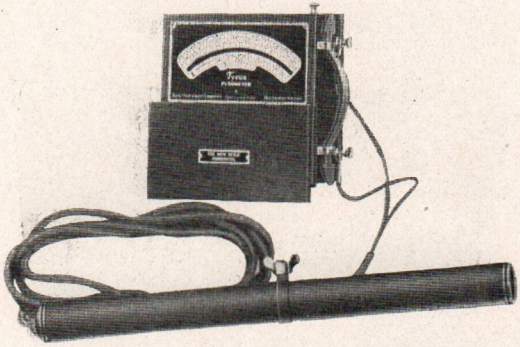
4475A Type 4060 Scale range; lower, 800° to 2400°, and upper, 1600° to 3600° F. $540.00

4475B Type 4060C Scale range; lower 500° to 1300°, and upper, 900° to 2000° C. 540.00

4475C Type 4060X Special low range scales; lower, 600° to 1800° F., upper, 1100° to 2700° F. 540.00

Furnished also with Recorders.

FOSTER *Tycos* FIXED FOCUS RADIATION PYROMETER



No. 4476A

Indicating Outfit, comprising receiving tube, 15-ft. flexible cable, portable indicator and instructions for use. The indicator is provided with a double scale. Ranges: lower, 1500° to 2400° F., upper, 1600° to 3600° F.

		Each
4476A	Type 4065, range 1500° to 2400° F. and 1600° to 3600° F.	$270.00

EXTRAS

4476B	Type 4065T	Receiving Tube	$180.00
	D	Special Scale on Indicator	18.00
	T	Collapsible Tripod	14.40

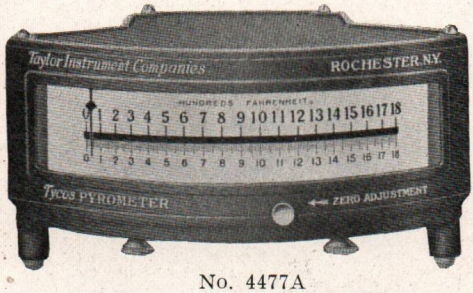
Recording Outfit, comprising receiving tube; patent single thread recorder calibrated to record temperatures direct over one standard scale range; 50 charts; flexible cable 15 ft. long with attachment tangs, and full instructions for use.

			Each
4476C	Type 4075	Range 1000° to 2400° Fahrenheit	$558.00
4476D	Type 4076	Range 1800° to 3600° Fahrenheit	558.00
4476E	Type 4075C	Range 600° to 1300° Centigrade	558.00
4476F	Type 4076C	Range 1000° to 2000° Centigrade	558.00

CABLES, ETC.

4476G	Type 4905F	Flexible 2-conductor, rubber cord, stranded copper, per ft.	$ .11
4476H	Type 4905M	Flexible metallic sheathing to protect cable, per ft.	.22
4476I	Type 4905W	Outdoor insulated wire, 2-conductor, together with one porcelain cleat for every 5 feet, per ft.	.07
		For quantities over 500 feet, per 1000 feet	50.40
	Y	Copper tangs fitted at both ends of No. 4905F cable	1.80

Tycos RARE METAL WALL TYPE INDICATOR



No. 4477A

SPECIFICATIONS

Millivoltmeter—High-resistance jewelled coil, mounted on polished steel pivots; combination knife-edge and target index for distant and close readings; mirror reflector, to avoid errors due to parallax. Note the long easy-reading scale.

Metal dust-proof case with binding posts marked for polarity. External zero adjustment. Swivel bracket furnished for wall mounting.

	Type	Range	Each
4477A	4250	0°—2500° F.	$144.00
4477B	4251	0°—3000° F.	144.00
4477C	4250C	0°—1400° C.	144.00
4477D	4251C	0°—1600° C.	144.00
	E B-E	Hardwood protecting case, extra	18.00

Same as above except for use with base metal Thermocouples.

	Type	Range	Each
4477F	4255H	0—1000° F.	$ 90.00
4477G	4265H	0—1800° F.	90.00
4477H	4267H	0—2200° F.	90.00
4477I	4255CH	0— 500° C.	90.00
4477J	4265CH	0—1000° C.	90.00
4477K	4267CH	0—1200° C.	90.00

Note—When supplied with thermocouple, price includes mounting bracket and 15-foot cable with attachment plug and tangs.

Tycos RARE METAL PORTABLE INDICATOR

A convenient Portable Pyrometer for general use in boiler tests, metallurgical tests, gas works, chemical plants, brick kilns, regenerative checkers, flues, etc., and for checking pyrometers permanently installed.

No. 4478A

SPECIFICATIONS

Millivoltmeter—High resistance, jewelled coil, mounted on hardened polished pivots. Scale has mirror reflector for close, accurate readings. Does not require leveling and can be transported without fear of injury.

Non-warping, walnut, dust-proof case with hinged protecting cover and carrying strap, external zero adjustment. Calibrated for *Tycos* Standard Rare Metal Thermocouples, in ranges as follows:

	Type	Range	Each
4478A	4200	0°—2500° F.	$126.00
4478B	4210	0°—3000° F.	126.00
4478C	4200C	0°—1400° C.	126.00
4478D	4210C	0°—1600° C.	126.00
4478E	4212	0°—2500° F. and 0°—1800° F.	144.00

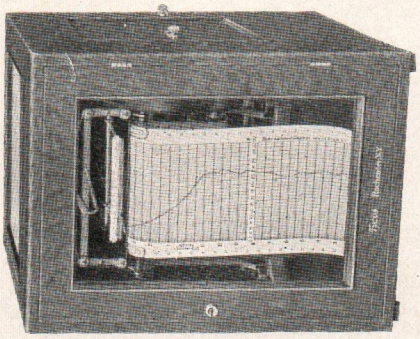
Type 4212 provided with 3 binding posts having combined Rare Metal (2500° F) and Base Metal (1800° F) Scales

Same as above except for use with Base Metal Thermocouples.

	Type	Range	Each
4478F	4275	0-1000° F.	$90.00
4478G	4285	0-1800° F.	90.00
4478H	4287	0-2200° F.	90.00
4478I	4275C	0- 500° C.	90.00
4478J	4285C	0-1000° C.	90.00
4478K	4287C	0-1200° C.	90.00

NOTE—When supplied with Thermocouple, price includes mounting bracket and 15-foot cable with attachment plug and tangs.

Tycos RECORDING PYROMETERS



No. 4479A

While in some operations a temporary indication of temperature is sufficient, modern manufacturing methods demand that continuous records be obtained throughout the duration of the majority of processes.

Recording of temperatures is especially desired where a process is continued over night, or where one or more shifts of labor are necessary.

A continuous record of temperature plainly printed on a chart possesses many advantages, a few of which are:

1. Gives faithful temperature data, independent of the human element.
2. Checks operators and avoids disputes regarding temperatures maintained.
3. Its records, if preserved, enable future precise duplication of results without difficulty and hence promote uniformity of product.
4. Shows exactly at what time certain temperatures were reached and how long they were maintained. This alone renders possible immense fuel saving.

The *Tycos* Thread Recorder was the first practicable and successful instrument made to record the small currents generated by the Platinum, Platinum-Rhodium Thermocouple. Many of the original Recorders are still in service after years of continuous use.

HIGH RESISTANCE RECORDER FOR RARE METAL THERMOCOUPLES

	Type	Range	Each
4479A	4300A	0°-2500° F.	$270.00
4479B	4310A	0°-3000° F.	270.00
4479C	4311A	0°-1800° F.	270.00

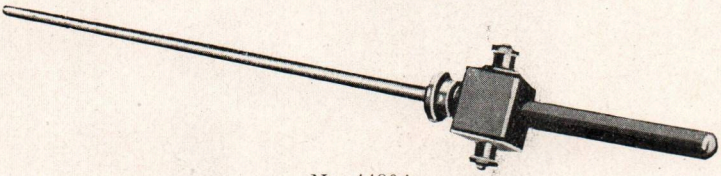
Price includes Recorder with Chart for 50 days and two extra impregnated threads.

LOW RESISTANCE RECORDER FOR BASE METAL THERMOCOUPLES

	Type	Range	Each
4479D	4354	0°- 750° F.	$180.00
4479E	4355A	0°-1000° F.	180.00
4479F	4355	0°-1200° F.	180.00
4479G	4365	0°-1800° F.	180.00
4379H	4367	0°-2200° F.	180.00
4479I	4355C	0°- 600° C.	180.00
4479J	4365C	0°-1000° C.	180.00
4479K	4367C	0°-1200° C.	180.00
	With extra High Resistance Meter—(500-600 ohms)		270.00
4479L	Extra Charts, 50 days, each		$2.88
4479M	Impregnated Threads in air-tight package, each		.90
	" " " " " , per dozen		9.00

PYROMETERS

RARE METAL THERMO-COUPLES



No. 4480A

FOR RECALESCENCE AND LABORATORY TESTS

This thermo-couple is especially convenient for recalescence and other laboratory work or where the material under test is small. As the elements are protected by a small porcelain stem, there is practically no lag in following rapid changes of temperature. The cold junction is protected by a hardwood head insulating it from changes of surrounding temperatures and a socket is provided for the introduction of a thermometer at this point when extreme accuracy is desired.

SPECIFICATIONS

HEAD. Hardwood, brass binding posts, screwed plug and split clamp for renewable tip.

WIRES. Platinum and platinum-rhodium throughout.

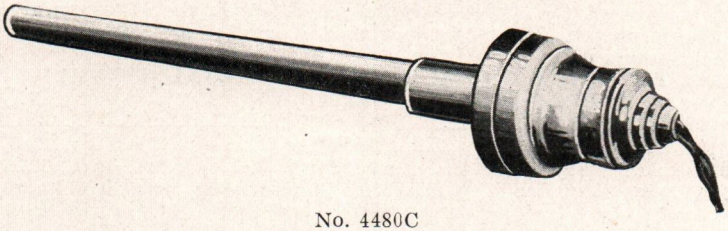
TIP. Porcelain or quartz, Outside diameter $\frac{9}{32}$ inch.

MAXIMUM TEMPERATURE. Quartz tip* 2500° F. Porcelain tip 3000° F. (in oxidizing atmospheres, otherwise 2500° F).

*If quartz tip is desired prefix letter Q, otherwise porcelain tip will be supplied.

4480A Length over all, 15 inches; exposed tip, 10 inches.....each $100.00
4480B Welded steel sheath, inside diameter, ⅝ inch for use on lead or salts baths..... 3.00

FOR PORTABLE USE OR FIXED INSTALLATION



No. 4480C

SPECIFICATIONS

HEAD. Attachment plug and socket, (non-reversible) with aluminum flange.

STEM. Steel, porcelain or quartz.

WIRES. Platinum and platinum-rhodium throughout.

MAXIMUM TEMPERATURE. Steel, 1500° F. Quartz stem, 2200° F. Porcelain stem, 3000° F. (in oxidizing atmospheres, otherwise 2500° F.) (Alundum 2600°.)

		A. P. or Q. Stems	Type	Steel Stems
4480C	18 inches	$108.00	4131	$ 95.00
4480D	27 inches	144.00	4131	125.00
4480E	39 inches	180.00	4131	144.00
4480F	60 inches	218.00	4131	252.00

STANDARD TYPE *Tycos* THERMOCOUPLES

Tycos STANDARD BASE METAL THERMOCOUPLES

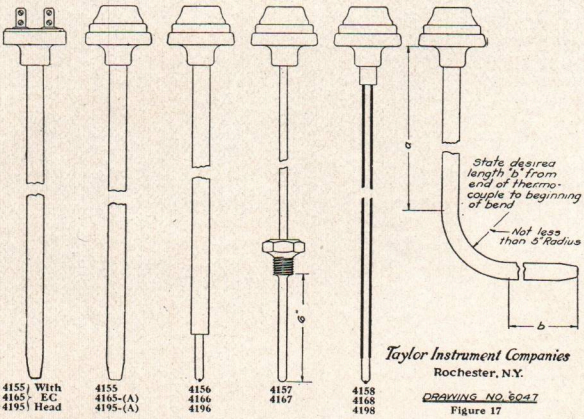


Figure 17

	Type	Range	Length	Diameter	Each
4481A	4155	200-1000° F.	27"-39"	⅝"	$ 9.00
4481B	4165	300-1800° F.	27"-39"	⅝"	9.00
4481C	4165A	300-1800° F.	27"-39"—Tycalloy	⅝"	12.60
4481D	4195	300-2200° F.	27"-39"	⅝"	9.00
4481E	4195A	300-2200° F.	27"-39"—Tycalloy	⅝"	12.60
4481F	4156	200-1000° F.	39"	⅝"	9.00
4481G	4166	300-1000° F.	39"	⅝"	9.00
4481H	4157	200-1000° F.	6" Below thd. / 18" Tip to flange	½" or 1" Standard Pipe Thread bulb diameter $\frac{7}{16}$"	9.00
4481I	4167	300-1800° F.	6" Below thd. / 18" Tip to flange	½" or 1" Standard Pipe Thread bulb diameter $\frac{7}{16}$"	9.00
4481J	4158	200-1000° F.	60"	Flexible	7.20
4481K	4168	300-1800° F.	60"	Flexible	7.20
4481L	4198	300-2200° F.	60"	Flexible	7.20

4481M Type E-C. End-connector-head 1.80

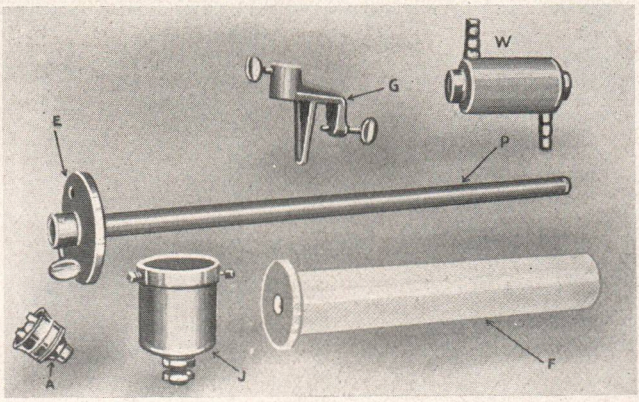
4481N Type L. Single bent stem, no extra cost. (Give length "b").
Additional bends each 1.80

4481O Type L-E. Extra short bend with pipe elbow 1.80

Thermocouples longer than standard	Per Foot
In metal stem	1.80
Flexible	.90

		Each
4481P	Thin-wall sensitive type thermocouple similar to 4155-65-95, furnished in 18-, 27-, 39-inch lengths. $\frac{7}{16}$ inches outside diameter	$ 9.00
4481Q	Union connection with 1-inch back fitting. Give distance from end of stem to bottom of thread	4.50

Tycos THERMOCOUPLE ACCESSORIES

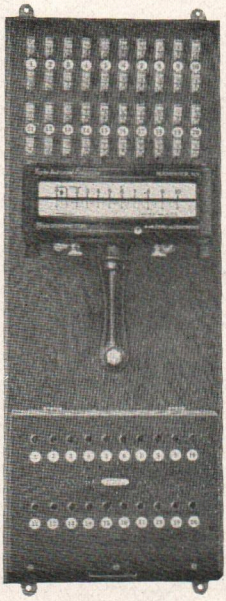


No. 4482A

	Type		Each
4482A	4105A	Attachment Plug. One required for each original thermo couple. Not required for renewal of thermocouple	$ 1.80
4482B	4105B	Porcelain Thermocouple Head. (Cap and base)	1.26
4482C	*4105D	Threaded Bushing brazed on stem, ¾″ or 1″	1.80
4482D	4105E	Detachable Flange. For regulating depth of immersion of thermocouple	2.52
4482E	4105F	Fire Clay (flanged) for protection of thermocouple. Outside diameter 3″. Bore 1⅛″. Closed end. "Corundite."	
		Length 18″	9.00
		Length 27″	12.00
		Length 39″	18.00
4482F	4105G	Detachable Hook for attaching thermocouple to tank or wall or container	2.52
4482G	4105J	Weather Hod for protecting head of thermocouple. With split clamp.	2.70
		Split Clamp with 1 foot flexible metallic sheathing or ½″ conduit	.90
4482H	4105P	Iron Protecting Sheath 27″ or shorter. Threaded for Flange E or Hook G (should be used in all metal baths above 600° F., also in furnaces where conditions warrant)	1.80
		Per foot extra length	.72
4482I	4105W	Water or Steam Jacket for regulating head temperature of thermocouple. Specify H for Hose connection, T for ¼″ Thread	4.50

*State distance from end of couple to bottom of thread.

Tycos MULTIPLE INDICATING PYROMETER EQUIPMENTS



No. 4483A

PUSH-BUTTON SWITCHBOARD

Many improvements are embodied in this superior form of switch, which is best suited to practically any type of pyrometer installation.

The contacts are hard platinum, preventing corrosion. They are self-releasing and enclosed in a hinged dust-tight case, protecting them from mechanical injury, yet are ready for instant inspection.

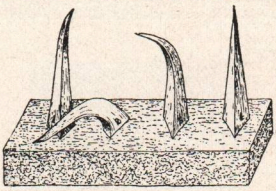
All the switches are permanently wired through the board to nickeled, bronze connectors, front mounted and plainly numbered, making cable connections extremely simple and accurate.

The switches are double pole, insuring freedom from grounds.

This switchboard is recommended for all indicating outfits and must be employed where combined indicating and recording outfits are used. It is especially adapted to this use, inasmuch as the indicator and recorder are never on the same circuit at one time. The two instruments can therefore be independently calibrated. This is an important advantage, as it permits the removal of either instrument from the circuit, should emergency demand it, leaving the remaining instrument intact.

	Type		Each
4483A	4934-2	2-Point Push Button Platinum Contact Switchboard	$21.60
4483B	4934-3	3-Point Push Button Platinum Contact Switchboard	28.80
		For each additional point	1.80

SEGER PYROMETER CONES



No. 4484A

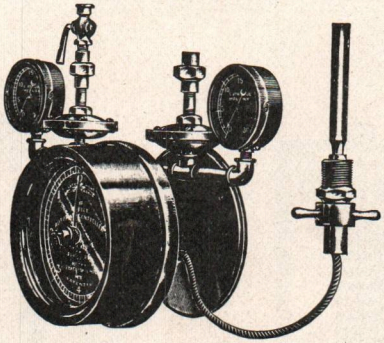
4484A Pyrometer cones, Seger, for use in ceramic industry ranging from 590° to 1910° Centigrade. In the following table are shown temperatures at which cones begin to melt.

Cone No.	Temperature Centigrade	Cone No.	Temperature Centigrade
022	590°	10	1330°
021	620°	11	1350°
020	650°	12	1370°
019	680°	13	1390°
018	710°	14	1410°
017	740°	15	1430°
016	770°	16	1450°
015	800°	17	1470°
014	830°	18	1490°
013	860°	19	1510°
012	890°	20	1530°
011	920°	21	1550°
010	950°	22	1570°
09	970°	23	1590°
08	990°	24	1610°
07	1010°	25	1630°
06	1030°	26	1650°
05	1050°	27	1670°
04	1070°	28	1690°
03	1090°	29	1710°
02	1110°	30	1730°
01	1130°	31	1750°
1	1150°	32	1770°
2	1170°	33	1790°
3	1190°	34	1810°
4	1210°	35	1830°
5	1230°	36	1850°
6	1250°	37	1870°
7	1270°	38	1890°
8	1290°	39	1910°
9	1310°		

These cones are sold in single numbers packed in boxes of 100 cones each, and also in assorted numbers, any quantity as desired.

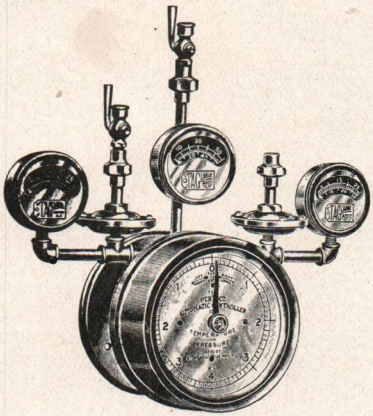
Price, per 100 ..... net, $3.00

"TAG" PERFECT AUTOMATIC TEMPERATURE CONTROLLERS
WITH FLEXIBLE CONNECTION
OR WITH FIXED BULB STEM
FOR TEMPERATURE RANGES FROM 40° to 900° F.
(or equivalent.)



No. 4485A

4485A **"TAG" PERFECT AUTOMATIC PRESSURE CONTROLLERS** with Standard Ranges from ½ to 400 pounds. (Extra sensitive ½ oz. to 5 pounds.)



No. 4485B

GUARANTEE

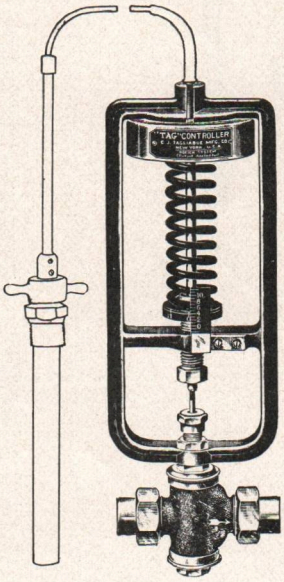
4485B **Replacement of any defective part** of a Tagliabue Controller, faulty either in material or workmanship, will be made by us without charge for such part.

Uniform Control of the temperature or the pressure, for which the Tagliabue Controller is set, is also guaranteed if the existing conditions do not make this impossible.

A Written Guarantee covering these points in detail ,is supplied with each Controller.

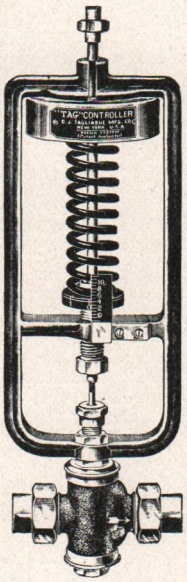
"TAG" SELF-OPERATING

PRESSURE AND TEMPERATURE CONTROLLERS



No. 4486A

For temperature ranges from 120° to 290°F.



No. 4186B

For pressure ranges from 2 lbs. to 150 lbs.

SIMPLE—Only five parts and no delicate adjustments or valves to cause confusion or annoyance. Simple to install and easy to operate.

DURABLE—All parts are heavy, strong and practically unbreakable—no weak link in its entire construction. Absolutely unaffected by vibration.

ECONOMICAL—The operating and maintenance costs are practically nil because no air compressor, piping, etc., are necessary.

SELF-PAYING—Aside from the foregoing economies, sufficient labor and steam are saved and spoilage reduced to defray the initial cost of these controllers in one season.

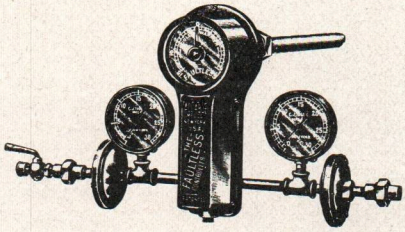
FOR FURTHER DETAILS ask for Bulletin 388.

"TAG" FAULTLESS

AUTOMATIC TEMPERATURE CONTROLLERS

For temperature ranges from 40° to 700° F.

(Maximum operating range 150° F.



No. 4487A

ADVANTAGES

No Stress or Strain

The use of compressed air as an auxiliary motive force imposes no stress or strain on the expansion-stem, as the power required for operating the auxiliary air valve is very slight.

Inconsiderable Friction

Also owing to the very little power needed for the above purpose and the consequent small amount of friction, a very slight movement of the expansion-stem can be utilized by interposing a lever between the expansion-stem and the valve-mechanism.

Slightest Movement Utilized

This regulates the motive force, thus sufficiently multiplying the movement of the expansion-stem to effect a change in the motive force supply even if such initial movement is extremely slight.

Expansion-Stem Quite Short

Also, because such slight movement of the expansion-stem is sufficient to accomplish the desired purpose, a relatively short expansion-stem can be used. The stem of the controller can, therefore, be applied in "close quarters" where a longer stem would be impractical.

Long Distance Transmission

Furthermore, by means of compressed air as a motive force, it is possible to transmit the initial movement of the expansion-stem to any point desired, for the final accomplishment of the work to be done, most effectively and rapidly.

Diaphragm-Motor Arrangements

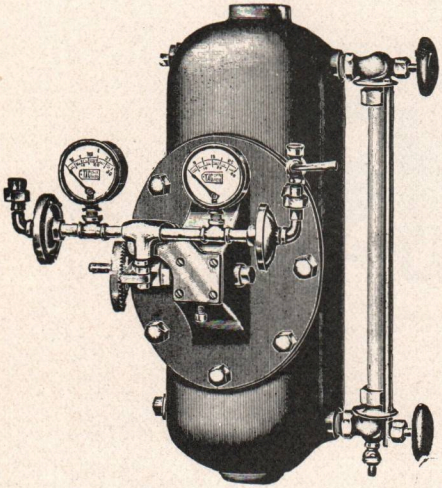
The motive force accomplishes its work by means of a diaphragm-motor, which latter may be either attached to a valve or to a lever, depending on whether the temperature effect is conveyed in a pipe line, for which a valve is used, or in a flue, for which a damper is employed.

FOR FURTHER DETAILS ask for Bulletin 430.

"TAG" P. & W. AUTOMATIC

LIQUID LEVEL AND CONDENSATE CONTROLLERS

FOR EVAPORATING, DRYING, HEATING AND COOKING APPARATUS



No. 4488A

ADVANTAGES FOR LIQUID LEVEL

4488A

4488A Additional evaporator capacity by increasing its efficiency fully 10 per cent.

Semi-film evaporation is obtained by maintaining the juice below the top of the tubes.

Skilled labor is unnecessary and gives the operator time for other stations.

Relieves High back pressure or engines and pumps.

Reduces incrustation and eliminates foaming or frothing.

ADVANTAGES FOR CONDENSATE

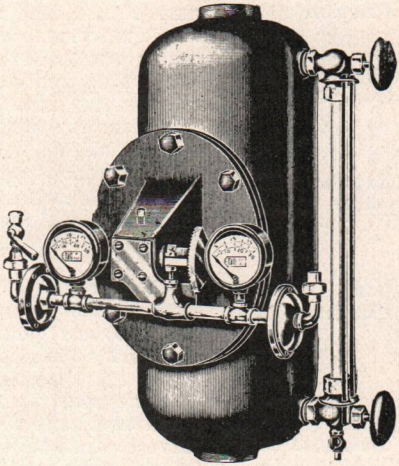
4488B

4488B Will handle any volume of condensate, its only limit being the size of the valve used.

Prevents costly interruptions caused by air-bound and sticking traps because this controller removes the air as well as the condensate.

Utilizes the heat units of the condensate.

Eliminates condensate pumps on some of the effects and prevents pump suction loss.



No. 4488B

FOR FURTHER DETAILS ask for Bulletin 406.

FIVE BIG ADVANTAGES OBTAINED BY USING "TAG" PERFECT AUTOMATIC CONTROLLERS

4489A

1. **Insure Absolute uniformity of product** due to their AUTOMATIC precision in maintaining the required uniform temperature or pressure.

2. **They save fuel** by conserving the steam supply or other heating medium—or prevent waste of the cooling medium—because only the EXACT amount required for the purpose is used.

3. **Valuable time is saved** because when the temperature or pressure is UNIFORMLY maintained at the point or points required, the desired results are obviously achieved far quicker than when the temperature or pressure constantly fluctuates.

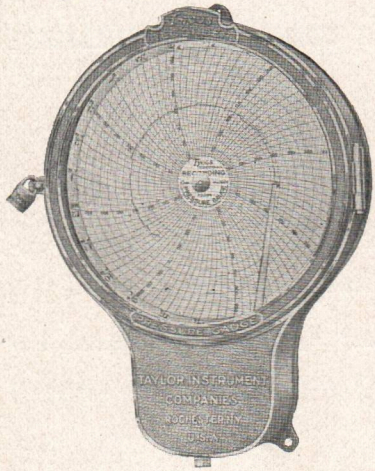
4. **Considerable labor** is saved because it is not necessary for the operator to continually juggle the hand valves in order to maintain the proper temperature or pressure—all that is necessary is to set the controller for the required temperature or pressure, and it is maintained AUTOMATICALLY until the expiration of the time of the operation.

5. **Maximum production at a minimum expense** is attained due to the foregoing reasons.

FOR FURTHER DETAILS write for Catalog 425.

UNIVERSALLY RECOGNIZED that "TAG" Perfect Controllers represent the highest degree of accuracy and dependability is evidenced by the fact that they are today being profitably employed in more than 200 different industries, and in thousands of plants throughout the United States, Canada, and foreign countries. Furthermore, they are recognized as "standard and approved equipment" by the foremost engineers.

Tycos RECORDING GAUGES FOR PRESSURE AND VACUUM



No. 4490A

Dial Type

The spring inside the case, which opens and closes as the pressure being measured fluctuates, is the vital part of the instrument, since the accuracy and permanent reliability of the Recorder depend on it.

Bourdon, or spiral-form, springs, selected from the very highest grade of material and carefully tested before calibration, are used for the higher pressures, while the diaphragm-form spring is used for low pressures.

Fifty years' experience in the manufacture of high grade pressure instruments (adopted by the U. S. Navy, U. S. Weather Bureau, British Admiralty and departments of other representative nations of the world) is a guarantee of the superior quality of *Tycos* Recording Gauges.

The *Tycos* Recording Draft Gauge is recommended for recording the pressure of air in ash pits of boilers, draft in boiler flues, etc., where the pressures measured are extremely low.

PRICING SCHEDULE AND DESCRIPTION OF *Tycos* RECORDING PRESSURE, VACUUM AND DRAFT GAUGES

These Recorders are regularly furnished with ¼-inch standard pipe thread, bottom connection, but when specified will be supplied with back connection, without extra charge.

When ordering state the number of the chart, the operating pressure range and the application. It is important that the application be specified. When the instrument is to be used to record the pressure of corrosive fluids, provision must be made to protect the pressure spring against damage from this source.

		Each
4490A	*Tycos* **RECORDING HIGH PRESSURE GAUGE.** Type 11900 For pressures of 10 pounds or higher. Dull-black-enameled case with ¼-inch fixed-thread bottom connection. Chart as selected.	$54.00
4490B	*Tycos* **RECORDING LOW PRESSURE GAUGE.** Type 11901 For pressures below 10 pounds. Dull-black-enameled case with ¼-inch fixed-thread bottom connection. Chart as selected.	63.00
4490C	*Tycos* **RECORDING VACUUM GAUGE.** Type 11910 Dull-black-enameled case with ¼-inch fixed-thread bottom connection. Chart as selected.	63.00
4490D	*Tycos* **RECORDING DRAFT GAUGE.** Type 11920 Dull-black-enameled case with ¼-inch fixed-thread bottom connection. Chart as selected. NOTE—Each instrument is furnished complete with 100 charts, bottle of Tycos Recorder ink and lock with key.	63.00
4490E	Extra for Moisture and Fume-Proof Case	10.80

RETORTS

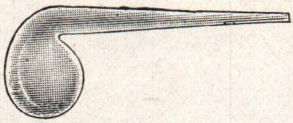
No. 4491A

No. 4491B

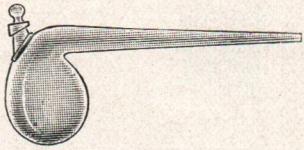
4491A **RESPIRATORS,** Cover's Patent. Most complete device ever offered for protecting the throat and lungs from dust, poisonsonous gases and all other impurities. Each ..... $ .50

4491B **RESTS FOR BOTTLES,** to put under bottles containing acids, etc., for protecting table.

Porcelain	1.00
Hard Rubber	.75



No. 4491C



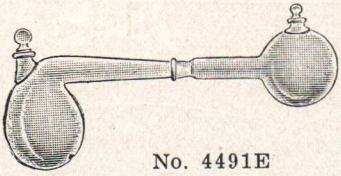
No. 4491D

4491C **RETORTS,** glass, plain.

Capacity	2 oz.	4 oz.	8 oz.	16 oz.	32 oz.	½ gal.
Price ..... each	$1.25	1.35	1.50	1.70	2.50	3.50

4491D **RETORTS,** glass, with tubulature and glass stopper.

Capacity	2 oz.	4 oz.	8 oz.	16 oz.	32 oz.
Price ..... each	$1.25	1.55	1.75	2.10	2.90



No. 4491E

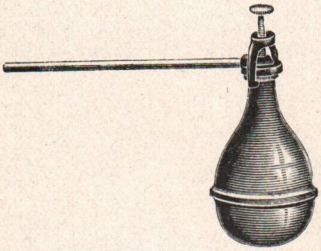
4491E **RETORTS,** with ground-in receiver, glass stoppered.

Capacity ..... oz.	4	8	16
Price ..... each	$2.00	3.50	5.00

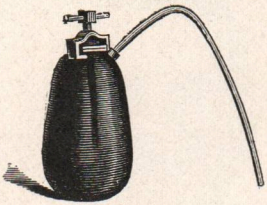
4491F **RETORTS,** Porcelain, with tubulature and stopper.

Capacity ..... oz.	4	8	16
Price ..... each	$2.50	3.00	4.50

RETORTS



No. 4492A

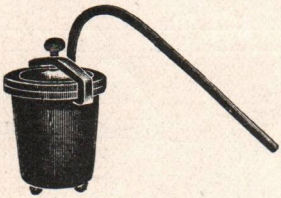


No. 4492B

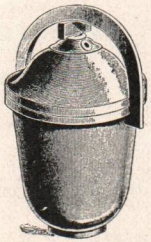
4492A **RETORTS, Copper.** For generating oxygen; with iron clamp and brass delivery tube.

Capacity ..... pts.	½	1	2	4
Each	$3.00	3.50	4.00	5.50

4492B **RETORTS,** Iron. For generating oxygen; dimensions, 11 inches deep, 7 inches in diameter. Cover is turned and fitted with asbestos packing, each ..... $ 7.50



No. 4492C



No. 4492D

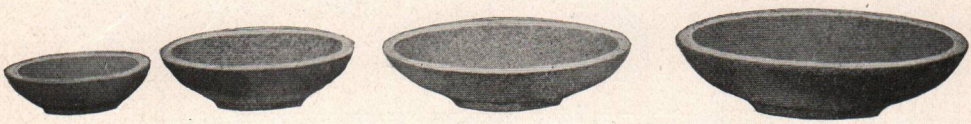
4492C **RETORTS,** Iron. For mecury distillation, etc.; movable cover fastened by screw clamp and milled smooth, making it absolutely tight fitting.

Capacity ..... pts.	½	1	2	4	8	16
Each	$6.00	6.50	8.50	11.00	14.50	16.00

4492D **RETORTS,** Nevada or Oval Type. Complete, with iron delivery tube.

Capacity ..... pts.	3	4	5	6	10
Holds quicksilver ..... lbs.	38	50	63	75	125
Weight ..... lbs.	18	25	30	44	65
Each	$7.50	8.50	9.50	12.00	17.00

RIDDLES, Sand. See Sieves.
RINGS, Concentric. See Water Baths.
RINGS FOR SUPPORTS. See Supports.



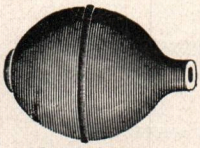
No. 4492E

4492E **ROASTING DISHES...** Of clay, very shallow,

Diameter ..... inches.	3	4	5	6
Per dozen	$0.90	1.00	1.20	2.00

All Clay Goods F. O. B. Denver.

RUBBER GOODS



No. 4493A No. 4493B No. 4493C No. 4493E

4493A Type 3124 **LABORATORY APRONS.** Made of rubber cloth, will be found a great protection to clothes as they are ample size, 36 inches wide by 50 inches long.
Each $1.00

4493B Type 3126 **RUBBER BULBS.** For pipettes.

Capacity ..... cc.	2	5	10	25	50
Each	$0.05	.05	.10	.20	.25

4493C Type 3128 **RUBBER BULBS.** With valve, capacity, 50 cc ..... .50

4493D Type 3130 **RUBBER BULBS or HAND BELLOWS.** With valve; two bulbs, for use with blow pipes, etc., giving a continuous blast 2.50

4493E Type 3132 **RUBBER FINGER COTS.** Of pure gum. Sizes, small, medium large and extra large.

Style	Light	Medium	Heavy
Per doz.	$0.80	.90	1.00

4493F Type 3134 **RUBBER PADS.** Of pure gum, ½ inch thick, for dressing amalgamating copper plates.

Size ..... inches	4x6	6x6
Each	$2.00	2.50

No. 4493G No. 4493H No. 4493I

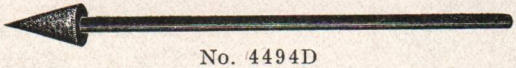
4493G Type 3136 **RUBBER STOPPERS.** Pure gum. Made in solid, one-hole and two-hole.

No.	Large End	Small End	No. to lb.
00	14 mm.	10 mm.	180
0	15 mm.	11 mm.	120
1	18 mm.	14 mm.	90
2	20 mm.	16 mm.	80
3	23 mm.	19 mm.	60
4	25 mm.	20 mm.	50
5	27 mm.	23 mm.	40
6	32 mm.	26 mm.	30
7	36 mm.	30 mm.	22
8	40 mm.	34 mm.	18
9	44 mm.	36 mm.	15
10	50 mm.	41 mm.	11
11	55 mm.	50 mm.	9
12	62 mm.	54 mm.	6
13	68 mm.	57 mm.	5

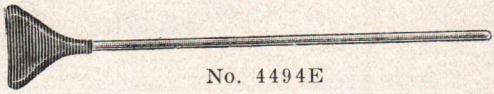
Per oz. ..... $0.25 Per lb. $3.00

Specify in ordering, whether one-hole, two-hole or solid are wanted.

RUBBER GOODS



No. 4494D



No. 4494E

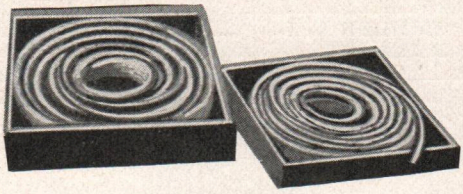
4494A **RUBBER SHEETING.** Pure gum, unvulcanized, in rolls, 3 feet wide, light, medium and heavy, approximate, per lb., on application.

4494B **RUBBER SHEETING.** Vulcanized on muslin, white, for mixing ore samples; rolls, 36 inches wide. Per yard $0.90

4494C **RUBBER SHEETING.** Same as above, black, per yard ..... .90

4494D **RUBBER STIRRERS.** Point a, flexible cone, for washing down walls of beakers. Each ..... .25

4494E **RUBBER TIPS,** so-called "Policemen." To be attached to glass rod, for scraping precipitates from walls of beakers. Per dozen ..... .50



No. 4494F

4494F ***RUBBER TUBING.** Black, pure gum, light wall. Per lb. $2.50

4494G ***RUBBER TUBING.** Black, pure gum, heavy wall. Per lb. 2.50

4494H ***RUBBER TUBING.** Red or antimony, best quality. Per lb. 1.50

4494I ***RUBBER TUBING.** Band, pure gum, light walls, for Gooch crucibles.

Width, flat ..... inches	1	1¼	1½	1¾
Per foot	$0.15	.20	.25	.30

4494J ***RUBBER TUBING.** White, heavy wall, best quality, hand-made, for conducting gas, etc.; in 12-foot lengths.

Inside diam. ..... inches	⅛	3/16	¼	5/16	⅜	½	⅝	¾
Per foot	$0.06	.10	.12	.15	.20	.25	.30	.40

4494K ***RUBBER TUBING.** White, light wall, hand-made, for connections.

Inside diam. ..... inches	⅛	3/16	¼	5/16	⅜	½
Per foot	$0.05	.07	.10	.12	.15	.20

*The above prices on tubing are only approximate, being generally sold by the pound.

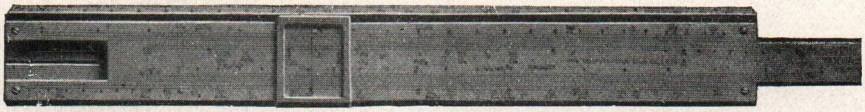
4494L **RUBBER TUBING.** White cloth insertion, heavy wall.

Inside diam. ..... inches	¼	⅜	5/16	½	⅝
Per foot	$0.10	.15	.15	.20	.25

4494M **RUBBER TUBING.** Extra heavy wall, for vacuum pumps, etc. Per pound $2.50

RUBBER TUBING, LABRUCO'S. Red and black—all sizes.

CHEMISTS' SLIDE RULES



No. 4495A

The performance of multiplication and division was greatly simplified by the introduction of logarithms by Briggs. It was attempted as far back as the beginning of the seventeenth century to represent logarithms graphically, and this attempt led to the invention of the slide rule. The logarithmic transforms multiplication into addition and division into subtraction.

It is the purpose of this instrument to effect a reduction of the time required for the calculation of chemical analysis to a few seconds, and at the same time to increase the accuracy of the results. The calculations for which it serves include multiplication, division, and the determination of various powers of numbers. The extraction of roots is also possible, but being somewhat more complicated and not being required in a chemists' ordinary work, omitted from this pamphlet.

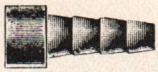
CALCULATION OF ANALYSIS

This involves the use of proportion and may be expressed by the equation $\frac{F \times P}{S} =$ per centage, in which F is the factor, P is the amount of substance found, and S is the quantity taken. As the factors are constant numbers they have a fixed place on the slide rule, and are indicated by a mark on the scale. Certain elements are determined in different forms of combination and have consequently different factors. The marks corresponding to the factors are placed above the logarithmic divisions in order not to cause confusion. In the calculation the runner must always be employed. In the case of elements or atomic groups, which are always determined in one and the same form of combination, for example carbon as CO_2, hydrogen as H_2O, there is entered in large letters along with the factor the symbol of the element or atomic group. In the case of elements which may be determined in different forms of combination the symbols of these different forms are expressed by smaller letters. The fact that the factors appear distributed both on the rule and on the slide promotes clearness and facilitates the readings.

4495A Price, each, with case and manual of instructions..... $10.00

4490B Price, each, duplex in case and manual of instructions..... 8.00

RULES, SAMPLES, ETC.

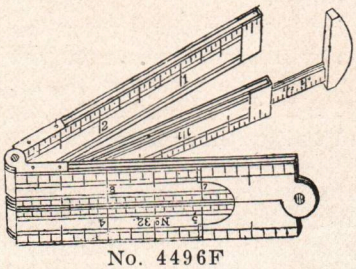


No. 4496A

No. 4496B

4496A **RUBBER HOSE CONNECTIONS.** Brass, with hydrant thread....$0.50
4496B Same as above, with ¾-inch I. P. female thread..... .50
4496C Same as above, but with male I. P. thread.

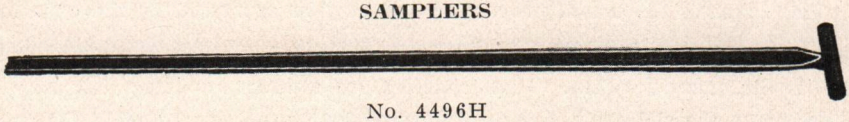
Size ....inches	¼	⅜	½
Each	$0.50	.50	.50



No. 4496F

4496D **RULES.** Of boxwood, 30 cm. and 12 inches.....$0.90
4496E **RULES.** Of boxwood, 60 cm. and 24 inches, four-fold..... 1.00
4496F **RULES.** Of boxwood, Metric and English, 30 cm. and 12 inches, folding 1.00
4496G **RULES, METRIC STICKS.** 1 meter on one side in millimeters, and 39 inches in one-eighths on the other..... .75
RULES, CHEMISTS, SLIDE. See Chemist Slide Rule.

SAMPLERS



No. 4496H

4496H **SAMPLER FOR CONCENTRATES OR SAND, ETC.**

Size ....inches	12	18	24	30	36
Each	$2.00	2.50	3.00	8.00	9.00

The 30 and 36-inch sizes have T handles.

"JONES" ORE SAMPLERS

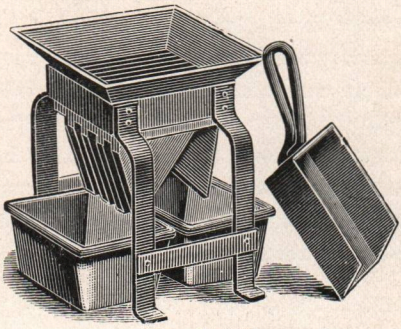
4496I Its construction facilities quick and even sampling. It consists of hopper set in 4-legged support, scoop and 4 sampling pans and brush. All parts can be easily cleaned.

Size, inches	4x4	6x6	8x10
Width of trays, ins.	½	½	¾
Price complete, each	$8.00	10.00	15.00

Larger sizes made to order.

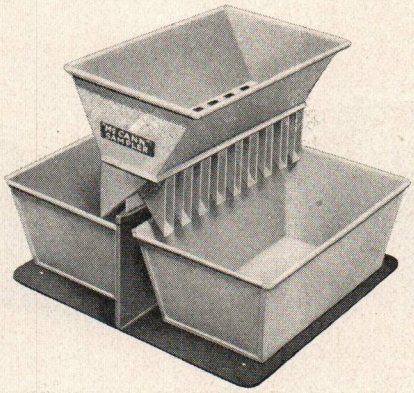
EXTRA BRUSHES

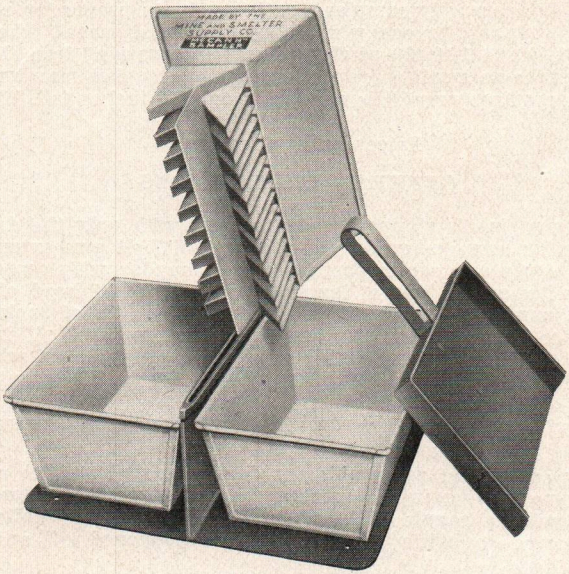
Price, each $0.50



No. 4496I

McCANN IMPROVED SAMPLERS





No. 4497A

THE McCANN SAMPLER. An improvement on all others—the heavy metal base forms the sampler support and pan top, eliminating the clumsy frame work heretofore used.

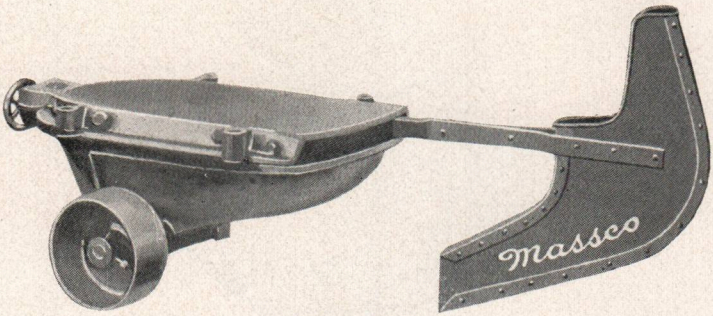
The short riffles, easily cleaned, reduce to a minimum the danger of salting. This sampler is especially constructed for rapid work.

Made in three stock sizes, as follows:

Number		4467A	4467B	4467C
Size	inches	4x6	6x10	8x12
Price	each	$8.00	10.00	12.00

Larger sizes made to order, prices on application.

THE SCOBEY TAILINGS SAMPLER



No. 4498A

4498A A simple, inexpensive machine for taking samples from a stream of pulp or tailings. It accurately samples, continuously, in proportion to the quantity flowing. Adjustment can be easily made by the hand wheel, whereby samples are taken from 1-500 to 1-10,000 of the pulp at intervals of from 7 seconds to 5 minutes. It can take so small a proportion that one bucket may hold a complete day's sample. It requires very little space and only 10 inches fall. Weight, 150 lbs.

Prices on application.

GENERAL INSTRUCTIONS

4498B The machine is shipped ready for use, with only the driving pulley's bucket and extension arm removed. Open cover and bolt arm extension in place, oil well, replace cover and set in position under launder with center line of machine directly under center line of launder. Place so that hood of bucket shall clear the end of launder by about one-half inch, and the lip of bucket have about the same clearance below the launder and in position to catch all drippings when making the stroke. Place driving pulley on shaft and tighten up set screws well; turn forward with the same travel as the hands of the clock until the bucket makes its stroke to see that all is clear.

The machine will not run backwards. It should have about twenty revolutions per minute.

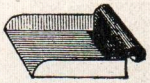
Arrange any convenient receptable for detaining the sample; a bucket with small overflow pipe leading into a small filter bucket that will lose no slime is convenient, otherwise a couple of tubs, one for each shift. While one is used the other is allowed to settle; the water then syphoned off and the sample collected.

One extra single and one extra intermittent gear are sent. To double the number of strokes, unbolt the yoke guides and remove yoke and guides; substitute the extra double gear for the single one in place; replace yoke and arm. To cause machine to make only half the number of strokes, use the extra single gear in place of the double gear.

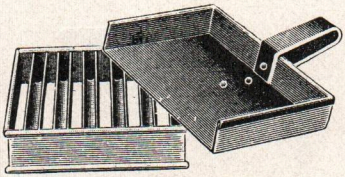
To gather a half or double amount of sample without changing gear, lengthen or shorten the travel of the bucket by turning the hand wheel adjustment contrary to or with the hands of the clock.

The width of the launder in no way affects the proportion or amount of sample taken, consequently it may always be made less than the bucket travel. A six, eight, ten or twelve-inch launder is convenient; a wider launder simply limits the possibility of regulating the travel of the bucket.

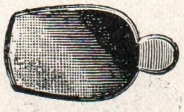
SAMPLERS, SCOOPS



No. 4499D



No. 4499A



No. 4499F

No. 4499G

4499A **SAMPLER, ORE.** With scoop. Sampler of tin with handle, scoop of sheet iron with band iron handle.

Dimensions	inches	6x6	9x9	12x12
Width of troughs	inches	½	½	¾
Price		$2.25	3.35	3.70

4499B **SAMPLER** only. Price $1.25 2.25 2.25

4499C **SCOOPS** only. Price $1.00 1.10 1.45

4499D **SCOOPS, AMALGAN.** Made of Russia iron, for scraping amalgam from plates.

Size	inches	3½x4	4x4½	4x6
Price, each		$0.30	.35	.40

4499E **SCOOPS, CRUCIBLE FILLER.** For pouring fluxes or ore into crucibles while in furnace.

Size	inches	3x17
Price	each	$0.75

4499F **SCOOPS, HORN.**

Size	inches	2x4	2¼x4¼	3x5	3½x5½	3¾x5¾
Price	each	$0.18	.22	.30	.40	.45

4499G **SCOOPS, RUBBER.** Made of hard rubber.

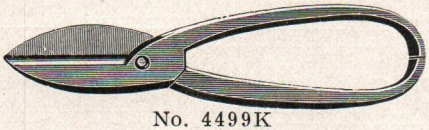
Size		Small	Medium	Large
Price	each	$0.40	.50	.80

4499H **SCOOPS, SAMPLING.** Made of heavy iron, with wood handle.

Size	inches	4½x5	5x8
Price	each	$0.90	1.00

4499I **SCOOPS, TIN.** For fluxes, etc.

Width of bowl	inches	5	6	7
Price	each	$0.45	.50	.60



No. 4499K

4499J **SHEARS.**

Length	inches	7½
Price	pair	$1.60

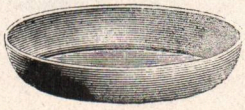
4499K **SHEARS.** Polished steel.

Length	inches	6	7½
Price	pair	$2.00	2.20

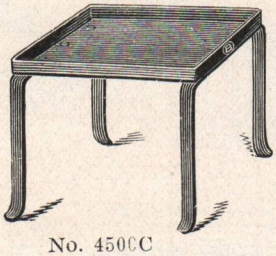
4499L **SHEARS.**

Length	inches	10	12	15
Price	pair	$2.00	2.50	3.00

SAND BATHS



No. 4500A



No. 4500C

No. 4500B

4500A **SAND BATHS.** Sheet iron, shallow.

Diam ....in.	3	4	5	6	8	10
Each	$0.10	.15	.20	.25	.50	.75

4500B **SAND BATHS.** Sheet iron, hemispherical.

Diam. ....in.	3	4	5	6	8	10
Each	$0.10	.20	.25	.30	.55	1.00

4500C **SAND BATHS.** Iron tray on four legs.

Size ....in.	6x8	8x10	10x12
Price ....each	$2.50	3.00	3.50

4500D **SAND BATHS,** of iron shallow form. These shallow sand baths make excellent sampling pans.

Diam. ....in.	2	3	4	5	6	7	8	10
Each	$0.10	.12	.15	.20	.25	.35	.50	.75
Per dozen	$1.00	1.20	1.35	1.45	2.20	3.00	3.60	4.20
Per 100	$6.00	7.00	8.00	10.00	15.00	20.00	25.00	30.00

4500E **SAND BATHS,** of iron, deep form (hemispherical).

Diam. ....in.	3	4	5	6	7	8	10
Each	$0.12	.20	.25	.35	.55	.70	1.50
Per dozen	$1.20	1.45	2.40	3.35	5.40	6.60	14.40
Per 100	$8.00	10.00	17.00	23.00	37.00	45.00	100.00

4500F **SAND BATH, RUEDORFF'S.** Of wrought iron, with three-row burner, adjustable in height, as illustrated, but without glassware.

Size ....inches	8x10	10x12
each	$11.00	13.50

4500G **SAND BATH.** Of case iron, mounted on removable legs.

Size ....inches	9x9	12x14
Each	$4.50	5.50

SAND PAPER, in sheets. Per dozen....$0.55

SAWS, BONE. See Dissecting Instruments.
SCALES AND SCALE PANS. See Balances.
SCALPELS. See Dissecting Instruments.
SCISSORS. See Dissecting Instruments and Shears.
SCLEROSCOPE. See Hardness Testing Apparatus.

Massco SCORIFIERS

No. 4501A

Our scorifiers are something of which we are especially proud. They are extremely satisfactory, and we recommend them without hesitation. Most careful attention has been paid in their manufacture to arrive at a mixture which is not too porous, nor on the other hand too close, endangering cracking.

4501A **SCORIFIERS.** Regular or deep pattern.

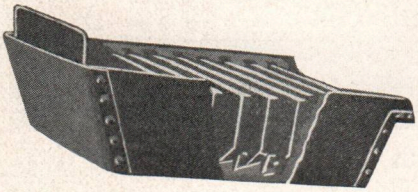
Diameter .....in.	1½	2	2¼	2½	2¾	3	3½	4
Price per 100.....	$1.80	1.86	2.00	2.25	2.65	3.10	4.15	5.00
No. in bbl.	3850	2000	2000	1750	1000	900	800	700
Gross wt. .....lbs.	245	255	285	320	235	245	280	306

4501B **SCORIFIERS, BARTLETT STYLE.** Shallow bowl, especially recommended for use where a large oxidizing surface is desired, for instance, in the scorification of a heavy sulphide ore.

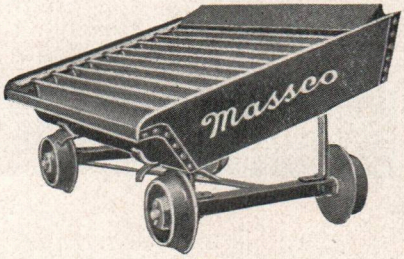
Diameter .....in.	1½	2	2¼	2½	2¾	3	3½	4
Price per 100.....	$1.80	1.85	2.00	2.25	2.65	3.10	4.15	5.00
No. in bbl.			3850	2000	2000	1750	1000	900
Gross wt. .....lbs.			245	255	285	320	235	245

GOLD SEPARATORS, AMALGAMATORS

PIERCE GOLD SEPARATOR AND AMALGAMATOR



No. 4502A



No. 4502B

This device is used for amalgamation in gold and silver mills, placer work and for removing free gold from cyanide pulp. It consists of numerous "L" shaped amalgamated copper riffles so arranged that the water carrying the pulp or sand sweeps all particles repeatedly against the amalgamated surfaces. "L" shaped bottoms of the riffles contain quicksilver into which rusty gold will sink by gravity.

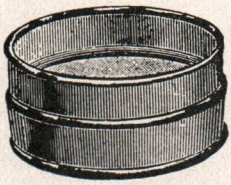
Each mill should have an extra set of these riffles, so that when it is desired to clean them up, the set in use is removed, the extra set being put in its place. After cleaning up the set removed, it is taken to the next battery and changed as at the first battery or mill, and so on through the mill, there being no stopping or shutting down any part of the mill for the purpose of cleaning up or for dressing them.

In mills where the ore slimes badly and carries a value that rises to the top of the water we put on an attachment to the riffles.

The riffles can be used to great advantage in cyanide mills by running the pulp through them and saving the free gold before it goes to the tanks. After the tarnished gold has been freed in the tanks by cyanide or other chemicals, it is passed through other sets of riffles so as to amalgamate the gold freed, thus saving much of the chemicals by not dissolving the gold, and considerable tankage capacity. Or the riffles can be set below the tanks so as to pass all of the pulp through them, thus catching any gold escaping by not being dissolved.

	Over-all Width, Length Height Inches	Width Inside Inches	Opening Inches	Capacity Tons 24 Hours	Eestimated Shipping Weight lbs.	F.O.B. Denver
4502A	8x24x5½	6	½	5 to 7	40	$100.00
4502B	10x24x5½	8	½	8 to 10	50	115.00
4502C	12x24x5½	10	½	10 to 15	55	140.00
4502D	17x24x5½	15	½	15 to 20	75	167.00
4502E	22x24x5½	20	½	20 to 25	95	205.00
4502F	27x24x5½	25	½	25 to 30	110	230.00
4502G	32x24x5½	30	½	30 to 36	140	290.00
4502H	38x24x5½	36	½	36 to 45	160	335.00
4502I	38x26x6½	36	⅝	45 to 55	175	365.00
4502J	38x28x6½	36	¾	55 to 75	185	370.00
4502K	38x33x6½	36	1	75 to 100	205	425.00
4502L	38x57x10	36	2	150 to 200	410	715.00

SIEVES



No. 4503A

No. 4503B

No. 4503C

4503A **SIEVES.** Brass cloth, tin frames, with pan bottom.

No. of Meshes per Lin. Inch	Number of Wire	Size of Opening Inches	Price, Each 8 In. Diam.	10 In. Diam.	Diam. 12 In.
10	24	.0799	$1.40	$2.00	$2.50
20	28	.0335	1.40	2.00	2.50
30	30	.0195	1.65	2.10	2.60
40	33	.0147	1.65	2.10	2.75
50	35	.011	1.75	2.40	2.75
60	36	.0091	1.90	2.75	3.00
70	37	.0077	2.00	2.75	3.00
80	38	.00675	2.20	3.00	3.25
90	39	.0061	2.35	3.30	3.60
100	40	.0055	2 60	3.50	4.00
120	42	.0043	3.30	3.80	4.50
150	44½	.0036	4.40	6.00	8.00
200	47	.002	6.60	9.00	11.00

4503B **SIEVES.** As above, 8 inches diameter, in nests of 7, viz.: 20, 30, 40, 50, 60, 80 and 100 mesh.....$14.00

We are prepared to nest above to suit purchaser. Sieves of any other diameter made to order and invoiced out at lowest figures.

4503C **SIEVE COVERS.** For above.

For sieves, diameter ....inches	8	10	12
Each	$0.40	.50	.60

4503D **PAN BOTTOMS.** For above.

For sieves, diameter ....inches	8	10	12
Each	$0.60	.80	1.00

4503E **SIEVES.** Wood frame S. C. Foundry riddles, 18 inches diameter, with double crimped iron cloth; mesh, 2, 4, 6, 8, 10, 12, 16 and 20. Each.....$1.00

THE TYLER STANDARD SCREEN SCALE SIEVES

This screen scale has as its base an opening of .0029-inch which is the opening in 200 mesh .0021-inch wire, the standard sieve, as adopted by the Bureau of Standards of the United States government, the openings increasing in the ratio of the square root of 2 or 1.414.

Where a closer sizing is required in the finer openings, a scale is shown below this table from 65 to 200 mesh, in which the openings increase in the ratio of the fourth root of 2 or 1.189.

No. 4504A

Opening in In. Ratio $\sqrt{2}$ or 1.414	Opening in Millimeters	Mesh	Diameter Wire, Decimal of an Inch	Brass Frames Covered with Brass Wire Cloth: 7-Inch Diameter List Price Each	8-Inch Diameter List Price Each	10-Inch Diameter List Price Each	12-Inch Diameter List Price Each
1.050	26.67	...	.149	$3.30	$4.00	$ 5.45	$ 6.95
.742	18.85	...	.135	3.30	4.00	5.45	6.95
.525	13.33	...	.105	3.30	4.00	5.45	6 95
.371	9.423	...	.092	3.30	4.00	5.45	6.95
.263	6.680	3	.070	3.10	3.70	5.00	6.30
.185	4,699	4	.065	3.10	3.70	5.00	6.30
.131	3.327	6	..36	3.10	3.70	5.00	6.30
.093	2.362	8	.032	3.10	3.70	5.00	6.30
.065	1.651	10	.035	3.10	3.70	5.00	6.30
.046	1.168	14	.025	2.85	3.40	4.50	5.65
.0328	.833	20	.0172	2.85	3.40	4.50	5.65
.0232	.589	28	.0125	2.85	3.40	4.50	5.65
.0164	.417	35	.0122	2.85	3.40	4.50	5.65
.0116	.295	48	.0092	2.85	3.40	4.50	5.65
.0082	.208	65	.0072	2.85	3.40	4.50	5.65
.0058	.147	100	.0042	2.85	4.30	5.90	7.60
.0041	.104	150	.0026	4.50	5.50	7.75	10.20
.0029	.074	200	.0021	6.15	7.60	10 95	14.75

FOR CLOSER SIZING—65 TO 200 MESH

No. 4504B

Opening in In. Ratio $\sqrt[4]{2}$ or 1.189	Opening in Millimeters	Mesh	Diameter Wire, Decimal of an Inch	7-Inch Diameter List Price Each	8-Inch Diameter List Price Each	10-Inch Diameter List Price Each	12-Inch Diameter List Price Each
.0082	.208	65	.0072	$2.85	$3.40	4.50	$ 5.65
.0069	.175	80	.0056	3.10	3.70	5.00	6.30
.0058	.147	100	.0042	3.55	4.30	5.90	7.60
.0049	.124	115	.0038	3.80	4.60	6.35	8.25
.0041	.104	150	.0026	4.50	5.50	7.75	10 20
.0035	.088	170	.0024	5.20	6.40	9.10	12.15
.0029	.074	200	.0021	6.15	7.60	10.95	14.75
Brass pan and cover				2.00	2.25	2.75	3.25
Tinned pan and cover.....				1.75	2.00	2.50	3.00

Igasp, 7 inches diameter; Igaza, 8 inches diameter; Igbom, 10 inches diameter; Igbug, 12 inches diameter. Igevo, include pan and cover.

In ordering testing sieves from this table, they must be specified as the "Tyler Standard Screen Scale Sieves."

TESTING SIEVES

Testing Sieves made to the Tyler Standard Screen Scale are recommended for all laboratory work, but the W. S. Tyler Company will make up testing sieves from wire cloth of any mesh and diameter of wire which may be required.

The table on this page shows the list prices on testing sieves made from the regular grade of brass wire and fine phosphor bronze wire cloth, as shown on page 68 of The W. S. Tyler Catalogue, No. 40.

Sieves coarser than 20 mesh take the same list price as 20 mesh.

				Brass Frames Covered with Brass Wire Cloth			
Opening in Inches	Opening in Millimeters	Mesh	Diameter Wire, Decimal of an Inch	7-Inch Diameter List Price Each	8-Inch Diameter List Price Each	10-Inch Diameter List Price Each	12-Inch Diameter List Price Each
.0340	.864	20	.016	$2.60	$3.00	$4.00	$4.90
.0198	.503	30	.0135	2.60	3.00	4.00	4.90
.0176	.447	35	.011	2.60	3.00	4.00	4.90
.0150	.381	40	.010	2.60	3.00	4.00	4.90
.0127	.323	45	.0095	2.70	3.25	4.25	5.25
.0110	.279	50	.009	2.70	3.25	4.25	5.25
.0087	.221	60	.008	2.70	3.25	4.25	5.25
.0073	.185	70	.007	2.85	3.40	4.50	5.65
.0068	.173	80	.00575	3.10	3.70	5.00	6.30
.0059	.150	90	.00525	3.30	4.00	5.45	7.00
.0055	.140	100	.0045	3.55	4.30	5.90	7.60
.0051	.130	110	.004	3.65	4.45	6.10	7.85
.0046	.117	120	.0037	3.80	4.60	6.35	8.25
.0043	.109	130	.0034	4.00	4.95	6.80	8.90
.0042	.107	140	.0029	4.25	5.20	7.30	9.55
.0041	.104	150	.0026	4.50	5.50	7.75	10.20
.0038	.096	160	.0025	4.75	5.80	8.20	10.85
.0035	.089	170	.0024	5.20	6.40	9.10	12.15
.0033	.084	180	.0023	5.65	7.00	10.00	13.45
.0031	.079	190	.0022	5.90	7.35	10.50	14.10
0029	.074	200	.0021	6.15	7.60	10.95	14.75
.0028	.071	220	.0017	6.60	8.20	11.85	16.00
.0026	.066	240	.0016	7.50	9.40	13.70	18.65
.0022	.056	260	.0016	8.45	10.60	15.50	21.25
.0020	.051	Twilled 280	.0016	9.40	11.80	17.35	23.85
.0017	.043	Twilled 300	.0016	11.25	14.20	21.00	29.00
Brass pan and cover				2.00	2.25	2.75	3.25
Tinned pan and cover				1.75	2.00	2.50	3.00

Irede, 6 inches diameter; Ireja, 7 inches diameter; Irepy, 8 inches diameter; Irgay, 10 inches diameter; Irgot, 12 inches diameter. Irisp, include pan and cover.

SILICA WARE

No. 4506A

The manufacture of articles of fused silica or quartz has engaged the attention of many experimental workers during the past few years, owing to the remarkable properties possessed by the material and the possibility of utilizing it for scientific and technical purposes, for which platinum or similar costly materials have only been available.

Vitreosil is unaffected by acids with the exception of hydrofluoric, and at high temperatures phosphoric. The action of phosphoric acid on silica only commences about 200° C., so that for all ordinary purposes it can be safely used with this acid.

Sulphuric, nitric, and hydrochloric acids, or a mixture of acids, such as aqua-regia, have absolutely no action on the material.

"Alkalis in solution are without upon VITREOSIL at low temperatures, so that in many fields of research work, as in conductivity experiments, it is to be preferred to glass apparatus. Hot solutions or fusions of the caustic alkalis attack VITREOSIL readily."

As an electrical insulator vitreosil is superior to glass, porcelain, and similar materials, the resistance decreasing much more slowly with rise of temperature.

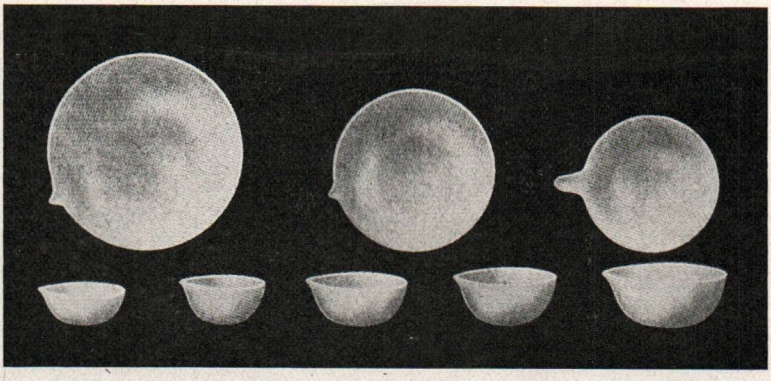
It also possesses the further advantage that moisture does not condense on its surface, and in consequence the surface leakage is much smaller than is the case with glass and materials of a ceramic nature.

"The melting point of VITREOSIL is approximately 1750° C., but it begins to soften at 1400° C., and when subjected for long periods to a high temperature it has a tendency to become brittle through reversion from the vitreous to the crystalline stage. VITREOSIL is not recommended for continuous work at temperatures in excess of 1100° C., although on intermittent work at much higher temperatures, such as pyrometric measurements, it will give satisfactory results."

It possesses a low coefficient of expansion, about 1/17th of that of ordinary glass, and is therefore unaffected by sudden and extreme changes of temperature.

Quotations for any spcial sizes and shapes will be given on application.

SILICA WARE



No. 4507A

No. 4507B to E

4507A EVAPORATING DISHES, deep shape.

Diameter ..... inches	2	2¾	3¼	3½	3⅞	6	7
Depth ..... inches	⅞	1	1¼	⅞	1¼	2½	2¾
Price	$1.50	1.75	1.90	2.05	2.40	4.75	5.55

4507B EVAPORATING DISHES, flat shape.

Diameter ..... inches	2½	2⅞	3¾	4⅞
Depth ..... inches	½	½	¾	⅞
Price ..... each	$1.75	1.90	2.05	2.80

4507C CRUCIBLES.

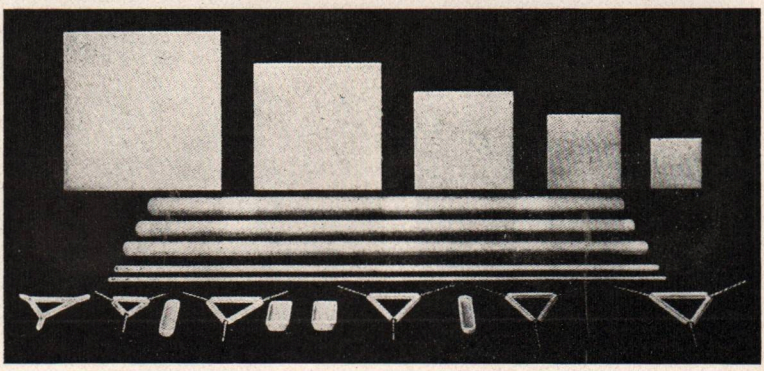
Diameter at Top ..... inches	1⅝	1⅝	1⅞	2¼	2⅝	2
Height ..... inches	¾	1	1⅛	1⅜	1¾	2
Price ..... each	$1.00	1.00	1.25	1.50	2.00	2.00

4507D CRUCIBLE COVERS, for above.

Diameter ..... inches	1¾	2	2⅜	2¾
Depth at Center ..... inches	¼	¼	⅜	½
Price ..... each	$0.75	1.00	1.25	1.50

4507E CAPSULES, for sugar analysis.
Diameter, 2 in.; height, 1 in.; flat bottom ..... each $2.00

SILICA WARE



No. 4508A

4508A COMBUSTION BOATS, without handles.

Length	inches	1¾	3	3	4	6
Width	inches	½	½	⅝	⅝	½
Depth	inches	5/16	5/16	⅜	⅜	½
Each		$0.75	1.25	1.50	1.75	2.25

4508B MUFFLES.

Length	inches	4½	9½	15½
Width	inches	2⅝	5⅞	13
Height	inches	2⅜	5	7⅛
Each		$2.50	5.25	15.75

4508C PLATES.

Thickness	inches	1/16	1/16	3/16	3/16
Dimensions	inches	4x4	6x6	4x4	6x6
Each		$0.60	1.35	1.00	2.25

4508D TRIANGLES, on Nickel Wire.

Size	inches	1½	2	2½
Each		$0.25	.25	.35

4508E TRIANGLES, all Silica.

Size	1½	2	2½
Each	$1.00	1.00	1.25

4508F TUBES, for Combustion.

Bore	inches	9/16	9/16	⅝	⅝
Length	inches	24	36	24	36
Each		$4.00	6.00	4.50	6.75

Measurements given are inside measurements.

4508G TUBES, for incinerations. Length, 16 inches; diameter, ¾ in. at one end, ⅛ in. diam. at other end ..... Each $5.25

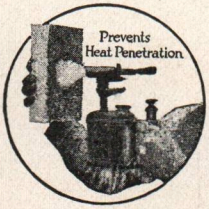
CELITE PRODUCTS

PRODUCTS:

SIL-O-CEL for high temperature insulation.

DESCRIPTION:

SIL-O-CEL is a light weight, silicious mineral product, supplied in the form of brick, block, powder and cement. It has the highest insulation value of any known commercial material and is used for insulating heated equipment at temperatures that would destroy other forms of insulation. It is sufficiently refractory so that no decomposition, fusing or excessive shrinkage occurs when it is placed behind ordinary fire-brick.



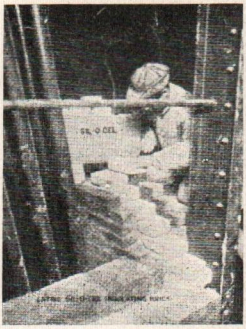
SIL-O-CEL

PREVENTS HEAT PENETRATION

TRADE MARK REGISTERED U.S. PATENT OFFICE

MADE FROM CELITE

No. 4509A



No. 4509B
Laying SIL-O-CEL Insulating Brick in Boiler

APPLICATION

SIL-O-CEL INSULATING BRICK—Used as an insulating backing for firebrick in all types of high temperature equipment to prevent loss of heat through walls. Made in standard firebrick sizes (9x4½x2½).

SIL-O-CEL BLOCKS—A bonded form of Sil-O-Cel made in sizes 6x18 inches, 1, 1½, 2 and 3 inches thick. Suitable where high temperature insulation is required in large sections.

SIL-O-CEL INSULATING POWDER—A light weight powder, possessing the same insulating qualities as Sil-O-Cel Insulating Brick, but used in work where brick is not adaptable; for example, in hot blast stoves, gas generator equipment, tops of ovens and boilers, and also for fire proofing and sound deadening in building construction.

SIL-O-CEL C-3—A semi-refractory material of high insulating value prepared in granular form suitable for high temperature insulation. It can be suitably bonded by the addition of 20 per cent. by volume of Portland Cement slightly moistened and rammed into place. Used in furnace bases, furnace doors, etc., and where a light weight semi-refractory material of high strength and good insulating value is required. (Process patented.)

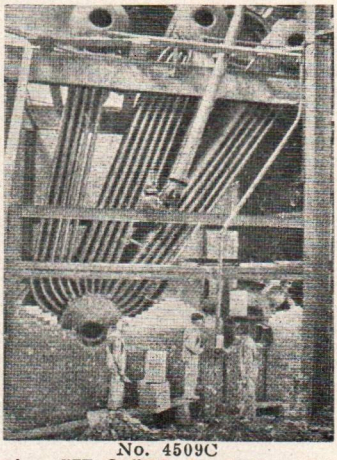
SIL-O-CEL C-22 BRICK—A semi-refractory type of Sil-O-Cel brick made in standard firebrick sizes. It is free from shrinkage at high temperatures and will not spall with sudden temperature changes. Recommended as an intermediate insulating course for the protection of the insulation under extreme temperature conditions.

SIL-O-CEL INSULATING CEMENTS—Adaptable for insulation of irregular surfaces, or in places where other Sil-O-Cel products are not adapted. They are prepared in three coats and applied as follows:

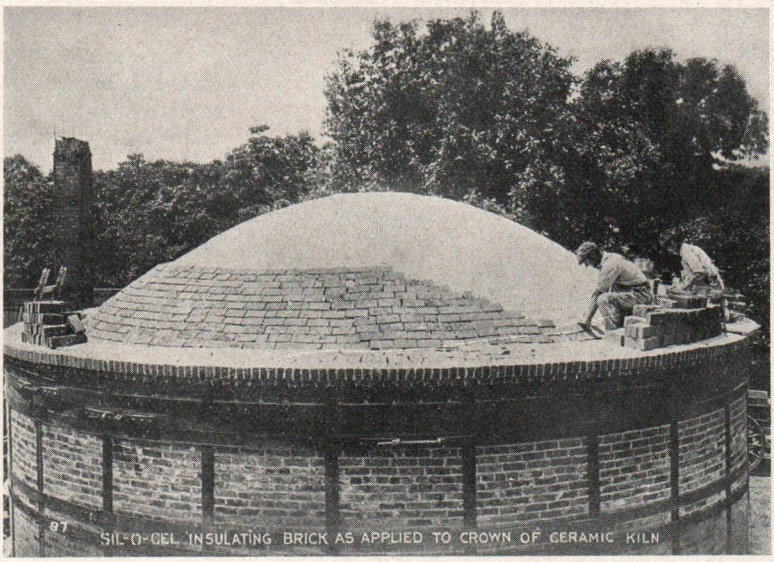
1. **Sil-O-Cel Sticking Cement** (First Coat) is used to produce a surface to which the second, or insulating coat, will adhere.

2. **85% Sil-O-Cel Insulating Cement** (Second Coat) is the insulating coat, having unusually high insulating value and durability under heat.

3. **Sil-O-Cel Hard Finish Cement** (Third Coat) is used to give the work a smooth, hard, durable finish.



No. 4509C
Laying SIL-O-CEL Insulating Brick in Boiler Setting



No. 4510A

This photograph shows the crown of a kiln at the plant of A. Reeder Chambers, Trenton, N. J., insullated with SOC Insulating Brick and Powder.

The crown of the kiln is started from the outside with a 9-inch brick laid in header form (they continue to lay circles of these until they reach the top); on top of this they grouted about ¼ inch of clay over which they laid 2½ inches of SOC Insulating Brick with broken butts and joints (the joints as thin as possible) and all crevices and uneven places filled in with SOC mortar.

When the job of SOC insulation was completed, they grouted over the SOC Insulating Brick with a mixture of one bag of SOC Powder (weight approximately 95 pounds) and one bag of fire clay about one-third the size of the SOC bag (weighing approximately 140 pounds). This was smoothed down and the red brirck were laid to a thickness of 2½ inches in this same kind of mortar, but the joints not filled up to the top, meaning, that if a trowel full of slush was laid down, it would ooze up between the bricks about one-half way due to the fact that the red brick were rammed in.

VARIOUS USES

SIL-O-CEL INSULATION has been successfully applied to the following equipment:

Boiler Settings	High Temp. Flues	Annealing Pits	Gas Generators
Hot Blast Stoves	Dust Catchers	Heat Treating Equip.	Gas Producers
Waste Heat Boilers	Kilns	Marine Boilers	Oil Stills
Metal Mixers	Regenerators	Coke Ovens	Core Ovens
Hot Metal Cars	Electric Furnaces	Pipe Coverings	Japanning Ovens
Hot Blast Mains	Enameling Ovens	Furnace Doors	Dryers
Bustle Pipes	Annealing Furnaces	Tanks and Vats	Bakers' Ovens
			Malleable Furnaces

ENGINEERING SERVICE

Our Engineering Department will gladly co-operate by going over blue-prints, making suggestions and advising on the proper insulation of any type of heated equipment.

Information without obligation—write for literature on your particular problem.

IMPROVE THE QUALITY OF YOUR FILTRATES

Eliminats all turbidity and impurities in your filtrates in one operation and simplifies the entire process. Chemists all over the country are resorting to the use of FILTER-CEL for greater brilliancy and perfect filtration.

Regardless of the type of press or cloths in use FILTER-CEL will give better results, and produce a more perfect and salable product every time.

FILTER-CEL is a porous, silicious product in powdered form, prepared from the mineral CELITE. It is extremely light in weight, of a high degree of purity and is so prepared as to make it most effective as a filtering medium for all classes of clarification.

FILTER-CEL

TRADE MARK REGISTERED U.S. PAT. OFFICE

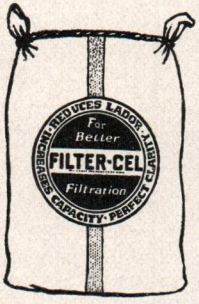
Small quantities of FILTER-CEL are added to the liquid to be filtered. The light weight of this medium simplifies the uniform mixing of FILTER-CEL with the liquid to be clarified. After mixing, filtration proceeds in the usual manner.

FILTER-CEL mingles with the suspended matter in complete uniformity building up on all parts of the cloth a porous cake which completely entrains the finest solids and prevents them from working through the pores of the cloths, rendering a complete separation of solids and liquids in practically one operation.

In carload lots of 25 tons, shipment is made direct from the mill at Lompoc, Cal.

Reduces labor by making possible the use of filter presses and other labor saving devices on visious and slow filtering liquids.

FILTER-CEL greatly improves the color of filtrates through perfect removal of dark, finely divided suspended substances and prevents all deterioration due to impurities.



No. 4511A

FILTER-CEL cakes are easily washed with a minimum quantity of solvent, due to the form and character of the cakes obtained.

FILTER-CEL increases the capacity of the filters by eliminating frequent stops for cleaning.

Less than carloads lots can be made at once from our warehouse at Denver.

We shall be pleased to aid you in improving the brilliance and quality of your filtrates.

Write for literature on better filtration. Samples sent on request.

SPATULAS AND SPOONS, ETC.

No. 4512A

No. 4512B

No. 4512C

SOLDERING BLOCKS. See Carbon.
SOLDERING IRON HEATERS. See Gasoline Torches.

4512A **SODIUM SPOONS.** With handles.....each $0.50
4512B **SPATULAS.** Glass. With ground blade; length, 6 inches....each .40
4512C **SPATULAS.** Horn. Best quality, very elastic.

Length .....inches	6	7	8
Each	$0.20	.25	.40

SPATULAS. Platinum. See platinum Spatulas.

4512D **SPATULAS,** glazed throughout. Long spatula one end, knob on the other. Type 551. Porcelain.

Size number	1	2	3	4	5	5a	6
Length .....mm.	115	155	200	275	310	345	442
Each	$0.35	.42	.62	.85	1.10	1.30	2.65

4512E **SPATULAS,** glazed throughout, satpual both ends. Type 552. Porcelain.

Size number.....	1	2	3	4	5	5a
Length .....mm.	105	120	150	195	212	225
Each	$0.25	.35	.42	.55	.72	.85

No. 4512F

No. 4512G

4512F **SPATULAS.** Steel. With cocoa wooden handle. For mixing and dividing.

Blade .....inches	3	4	5	6	7	8	10	12
Each	$0.40	.50	.60	.70	.85	1.00	1.25	1.75

4512G **SPATULAS.** Steel. Artists palette knives. Wooden handle.

Blade .....inches	3	4	5
Each	$0.45	.55	.90

No. 4512H

No. 4512L

4512H **SPATULAS.** Steel. Nickel-plated, steel handle.

Length .....inches	4	5	6	7	8	9
Each	$0.90	1.00	1.30	1.50	1.65	2.40

4512I **SPONGES.** For respirators.....per dozen $1.50
4512J **SPONGES, UNBLEACHED** .....per lb. 3.50
4512K **SPATULAS,** spoon on one end, spatula on the other. Type 553.

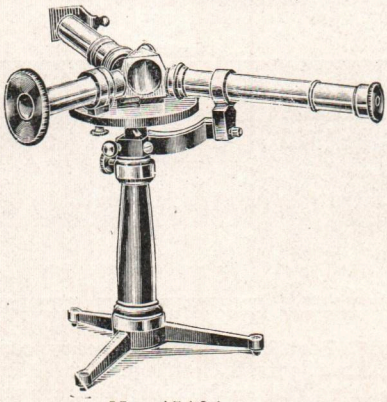
Size number	1	1a	2	3	4	4a	5	6
Length .....mm.	96	120	140	160	190	203	247	490
Each	$0.21	.27	.38	.50	.60	.75	.85	2.75

4512L **SPOONS.** Horn. Best quality, with spatula end.

Length .....inches	4	5	6	8	10
Each	$0.15	.20	.25	.35	.45

SPOONS, COMBUSTION OR DEFLAGRATING. See under Combustion.

SPECTROSCOPES



No. 4513A

4513A **SPECTROSCOPE.** On adjustable Stand, with medium sized flint glass prism, observation tube and telescope of 20 mm. aperture, and 14[illegible] mm. focal distance. Provided with slit, with micrometer screw and comparison prism. Dispersion 4°. Price on application.

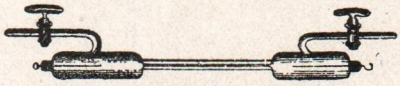
4513B **SPECTROSCOPE.** On Adjustable Stand, with prism of flint glass, observation tube and telescope of 20 mm. aperture and 182 mm. focal distance. Provided with scale tube, slit with micrometer screw and comparison prism. Dispersion 4°.

Accessories: Bunsen burner with air regulator and chimney, 12 tubes with platinum wire, one stand, two spectroscopic charts and five millimeter scales. Price on application.

4513C **SPECTROSCOPE.** Large, on Adjustable Stand, with very dense flint glass prism, enclosed in brass case. With observation tube and slit, telescope of 22 mm. aperture and 182 mm. focal distance. A gas burner with movable arm is attached to the scale tube, the adjustable slit is provided with comparison prism and micrometer screw. Focused by rack and pinion.

Accessories: Two Bunsen burners, adjustable, with chimney, 12 tubes with platinum wire and two sands, two spectroscopic charts and five millimeter scales. Price on application.

No. 4513D

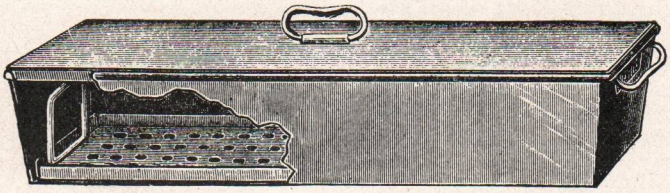


No. 4513E

4513D **SPECTRUM TUBES,** filled with glass.
4513E **SPECTRUM TUBES,** with two stop-cocks, for self-filling.
4513F **SPECTRUM CHARTS,** small, plain.
4513G **SPECTRUM CHARTS,** small, colored.
4513H **SPECTRUM CHARTS,** large.
4513I **SPEED INDICATORS,** in pasteboard box.
4513J **SPEED INDICATORS,** in leatherette case.

All prices on application.

STERILIZERS

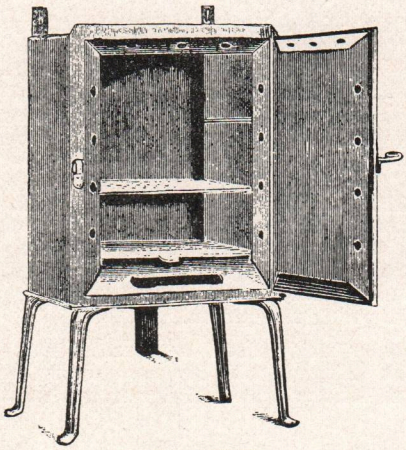


No. 4514A

PORTABLE INSTRUMENT STERILIZER

4514A **STERILIZERS,** Portable. Made of heavy copper, tinned inside and polished outside, with perforated tray for lifting out or immersing the instrument; is a convenient size to carry in the instrument bag. Size 15x3½x3½ inches. Type 1026. Each $8.00

Larger sizes quited on application.



No. 4514B

HOT AIR STERILIZERS

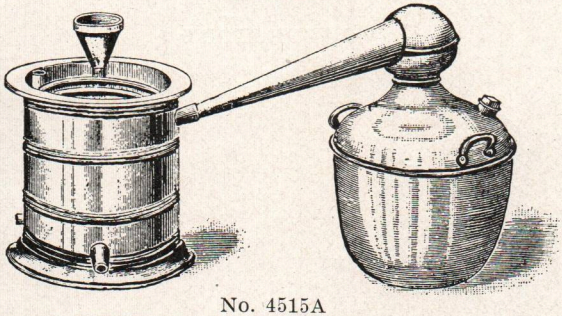
4514B **STERILIZERS,** Hot Air. Of an upright pattern, with ears to hang up and support for burner.
Type 1053 9 inches high, 12 inches wide, 9 inches deep, each $16.00

4514C Type 1054 Same as above, but covered with asbestos..... 22.00

Other sizes quited on application.

Electric Sterilizers and Ovens, see Electric Apparatus.

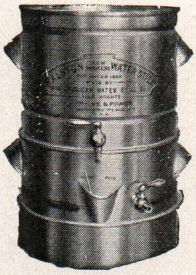
STILLS



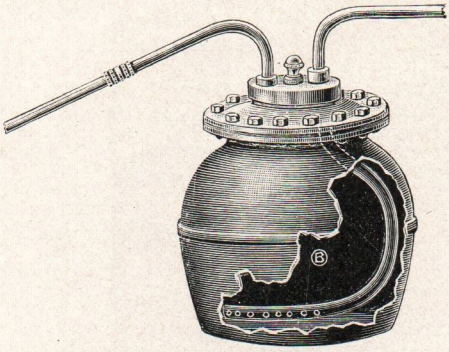
No. 4515A

4515A **STILLS, OR DISTILLING APPARATUS.** For water, spirits, etc. A tin-lined copper retort and zinc cooler, with block tin worm. All stills are tubulated and of superior make.

Capacity ....gals.	½	1	2	3	5
Complete	$12.00	18.00	25.00	30.00	40.00
Extra parts.					
Still	$8.00	10.00	15.00	18.00	25.00
Condenser	$5.00	8.00	10.00	12.00	15.00



No. 4515B



No. 4515C

THE RALSTON NEW PROCESS WATER STILL

4515B Is a device for purifying water by distillation and is intended for operation upon the kitchen stove or a small gas burner. You don't have to learn to run it because there is nothing to run. Fill it to the proper level with water and place it over any heating apparatus and it will distill at least one quart per hour. Under similar conditions of operation, we guarantee it to furnish a larger amount of pure water than any other still made. Price $16.00

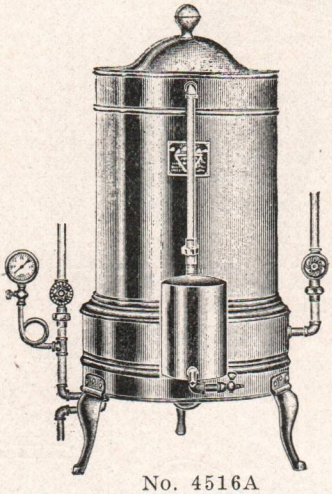
4515C **DISTILLING APPARATUS.** For destructive distillation. For distillation of heavy oils and other liquids or solids requiring a high heat. The distillation may be made by live steam or by direct heat, with or without agitation by hot air blown through as desired. The still is made of heavy copper and will be found a great convenience in many laboratories. Type 1546.

Made in the following sizes:

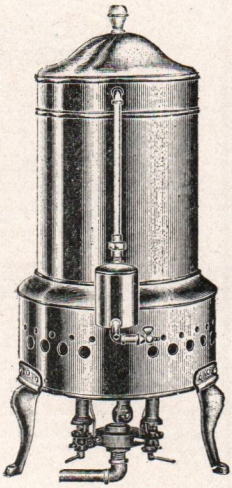
Capacity ....gallons	½	1	2	3	5
Price	$16.00	25.00	35.00	45.00	60.00

STILLS

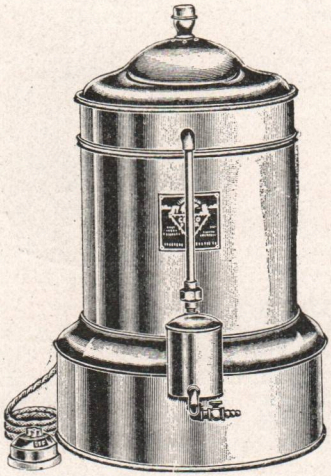
LABORATORY



No. 4516A



No. 4516B



No. 4516C

Note—Any of these Stills can be had in 2-quart to 10-gallon capacity.

No. 4516D

4516A **STEAM OPERATED STILL** for laboratory. Type 50. Capacity 2 gallons per hour $85.00

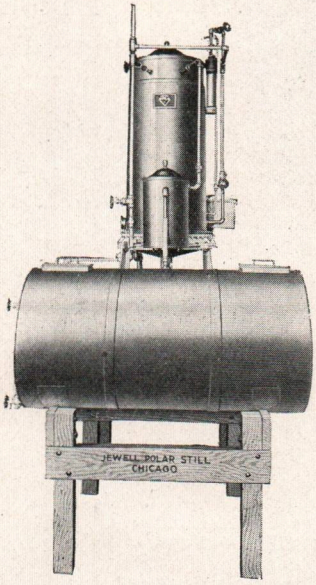
4516B **GAS OPERATED STILL** for laboratory. Type 60. Capacity 1 gallon per hour 70.00

4516C **ELECTRICALLY OPERATED STILL** for laboratory. Type 70. Capacity 1 gallon per hour 80.00

4516D **GASS OPERATED STILL** for laboratory. Type 90. Capacity 2 quarts per hour 25.00

H^2O—DISTILLED WATER

FOR DRINKING, CHEMICAL, PHARMACEUTICAL, SURGICAL AND PARTICULAR INDUSTRIAL PURPOSES



No. 4517A

4517A Manufacturers generally have come to realize the costly disadvantage of hard, impure water and have adopted the JEWELL POLAR STILL to provide chemically pure water for some, if not all, of their manufacturing processes.

4517B Frequently trouble of long standing, not previously attributed to water, disappears with the first use of distilled water.

4517C There are thousands of JEWELL POLAR STILLS in continuous daily service. A list of users is a roster of many of the best known industrial and other institutions.

4517D SIMPLE, COMPACT AND DEPENDABLE. AUTOMATICALLY ELIMINATES GASES AND ODORS AS WELL AS ALL MATTER IN SUSPENSION OR SOLUTION.

4517E Built in capacities from ½ to 1,000 gallons per hour with or without storage tanks.

A POSITIVE AND PERMANENT DRINKING SUPPLY

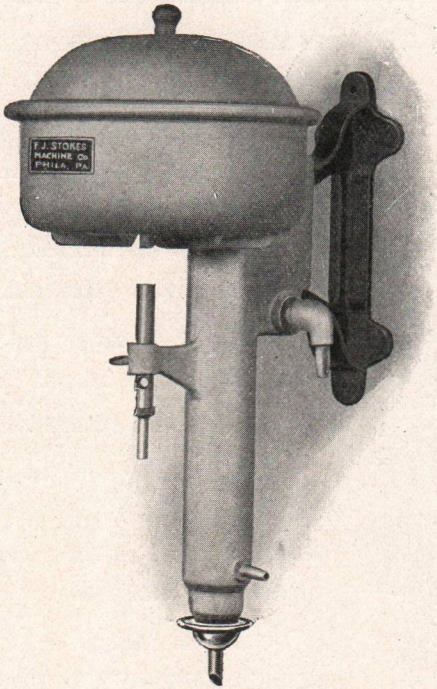
4517F The JEWEL POLAR STILL offers a positive, permanent and economical means for solving the drinking water problem in office, factory, camp, hotel, hospital, vessels, etc. Over 350 vessels are equipped with JEWELL POLAR STILLS. Bottled water concerns in hundreds of cities use JEWELL POLAR STILLS.

Prices on application.

Write for literature.

STILLS

WATER



No. 4518A
Type "O" Gas Laboratory Still

SPECIAL FEATURES

By a clever construction this Still accomplishes several novel results. First, it utilizes the heat generated in the still for pre-heating the incoming water to the boiling point and thus a small quantity of steam will operate the still after it is once started. Second, by pre-heating the feed water before it enters the distilling basin, the ammonia and other gases due to impurities in the raw water, are liberated and escape into the air through an opening provided for this purpose. Third, the condenser tubes extend to the extreme top of the steam chamber, high above the water level, so there is no danger of the raw water being carried over by the steam. Fourth, the still can be easily cleaned by opening the valve connecting with the drain and flushing, or by removing the lid on top and scrubbing. The copper steam coil can also be easily disconnected for the removal of scale in case the feed water deposits same.

GUARANTEE

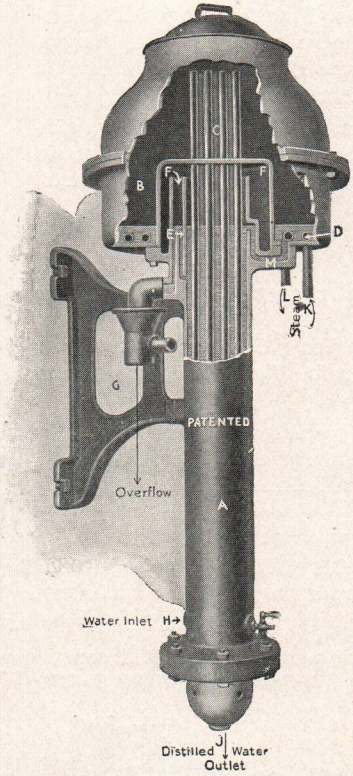
The Stokes Stills are guaranteed to have the capacities stated and to produce chemically pure water.

COST OF PRODUCTION

Distilled water produced by the Gas Still costs 2c a gallon, and by the Steam Stills ⅕c to ¼c a gallon.

STILLS

WATER



No. 4519A

Sectional View Showing Principle of Stokes Automatic Water Still

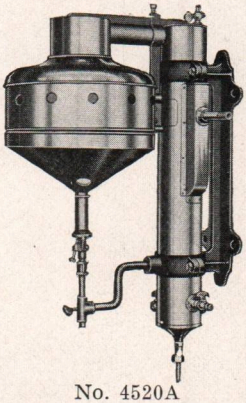
PRICE LIST

No.	Size	Hourly Capacity	Method of Heating	Size of Boiler to Operate	Weight	Height	Price
4519A	* 0	½ gal.	Gas		35 lbs.	24 in.	$ 20.00
4519B	† 00	¾ gal.	Gas		35 lbs.	24 in.	22.00
4519C	‡ 000	2¾ gals.	Gas		110 lbs.	48 in.	40.00
4519D	1	5 gals.	Steam	2 h. p.	275 lbs.	3 ft. 6 in.	110.00
4519E	2	10 gals.	Steam	4 h. p.	325 lbs	4 ft. 6 in.	165.00
4519F	3	25 gals.	Steam	10 h. p.	750 lbs.	7 ft. 0 in.	275.00
4519G	4	60 gals.	Steam	20 h. p.	1200 lbs.	7 ft. 6 in.	500.00
4519H	5	100 gals.	Steam	30 h. p.	1500 lbs.	7 ft. 6 in.	650.00

* This size can be furnished heated by gasoline for $27.00
† This size can be furnished heated by steam for 27.00
‡ This size can be furnished heated by steam for 65.00

STILLS

GAS OPERATED TYPE



No. 4520A

4520A Our apparatus has the unqualified approval of all the leading storage battery manufacturers, and over one thousand distributors have installed "Rochlitz" 'Stills in their stations.

Produce distilled water for your own needs, also for sale at a splendid profit to garages, gas and electric car owners, druggists, hospitals, physicians, chemists, and other users of distilled water.

With distilled water at hand you can purchase C. P. Acid, and reduce it to proper battery strength, thus saving transportation charges on carboys and water.

Costs approximately 2c per gallon with $1.00 gas.

Your profit from the sale of distilled water will quickly pay for the still.

Highly efficient and especially designed Auto Blast Bunsen Burners are furnished for either natural or manufactured gas.

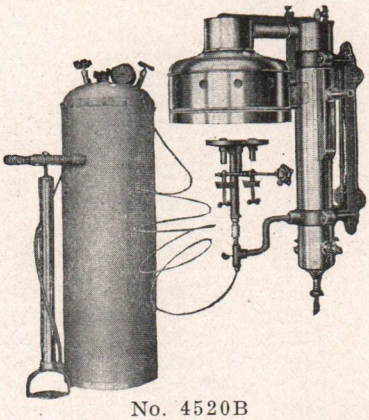
Size	1	2	3	4	5
Capacity in 1 hr.....gals	½	1	2	3	5
Price F. O. B. Factory	$30.00	45.00	85.00	125.00	165.00

GASOLINE OR KEROSENE OPERATED TYPE

4520B The cost of producing distilled water with this equipment is approximately 1½ cents per gallon.

Capacities, ½ to 5 gallons per hour.

Equipment furnished with oil-operated Still consists of steel pressure tank, capacities 8 to 11 gallons, air pump, pressure gauge, 20 feet copper tubing, valves, burner, etc.

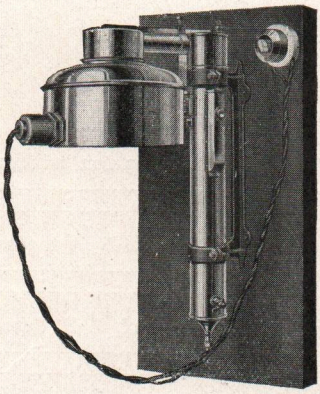


No. 4520B

Our Kerosene and Gasoline Burners are Powerful, Wickless and Odorless.

Size	1	2	3	4	5
Capacity in 1 hr.....gals	½	1	2	3	5
Price F. O. B. Factory	$45.00	65.00	105.00	125.00	175.00

STILLS



No. 4521A

ELECTRICALLY OPERATED STILL

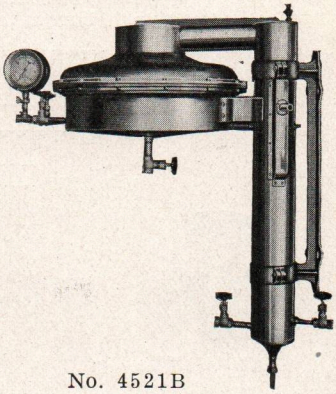
4521A Equipped with Westinghouse Bayonet Type Immersion Heaters.

SPECIAL FEATURES—The heater is easily cleaned because removable. Is highly efficient because all the heat must go into the liquid. Substantially built and rugged and capable of withstanding lots of wear. Control switch with 6 feet of cord supplied. Heating units furnished for all standard voltage up to 250 volts, alternating or direct current. Capacities, ½ to 5 gallons per hour.

Size	2	3	4	5
Capacity in 1 hour ... gals.	1	2	3	5
Price, F. O. B. factory	$885.00	110.00	165.00	225.00

STEAM OPERATED TYPE

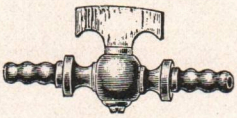
4521B Attachable to any boiler. Costs little to install. Simple and effective to operate. Produces water at cost of 1/10 of a cent per gallon. Will purify water however bad. Constructed entirely of copper and brass and therefore has no parts to corrode. Made in sizes producing from 1 gallon to 15 gallons per hour.

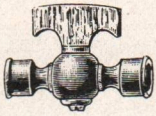


No. 4521B

Size	1	2	3	4	5	6	7
Capacity in 1 hour ... gals.	1	2	3	5	8	10	15
Price F. O. B. factory	$50.00	75.00	115.00	135.00	175.00	225.00	300.00

STOPCOCKS


No. 4522A

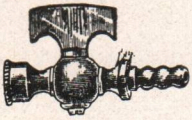

No. 4522C

No. 4522B

4522A **STOPCOCKS,** Brass. Both ends, nipples for tubing,
⅛-inch bore $0.85
¼-inch bore 1.10

4522B **STOPCOCK,** Brass. Both ends, ⅛-inch I. P. male thread.
⅛-inch bore ..... .75
¼-inch bore ..... .100

4522C **STOPCOCKS,** Brass. Both ends, ⅛-inch I. P. female thread,
⅛-inch bore ..... .75
¼-inch bore 1.00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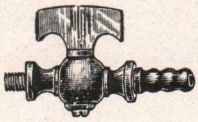
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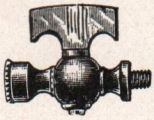

No. 4522F

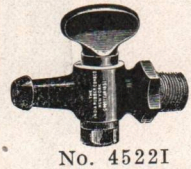
4522D **STOPCOCKS,** Brass. With nipple and ⅛-inch I. P. female thread,
⅛-inch bore ..... .85
¼-inch bore 1.10

4522E **STOPCOCKS,** Brass. With nipple and ⅛-inch I. P. male thread,
⅛-inch bore ..... .85
¼-inch bore 1.10

4522F **STOPCOCKS,** Brass. With ⅛-inch I. P. male and female thread,
⅛-inch bore ..... .90
¼-inch bore 1.10

4522G **STOPCOCK NIPPLES.** With male thread,
⅛-inch bore ..... .40
¼-inch bore ..... .40

4522H **STOPCOCK NIPPLES.** With female thread,
⅛-inch bore ..... .40
¼-inch bore ..... .40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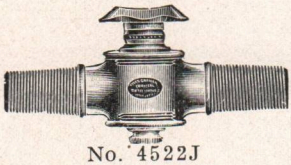
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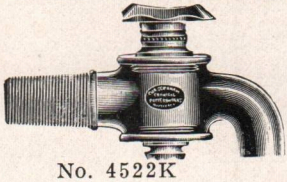

No. 4522K

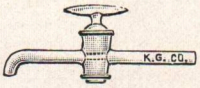
4522I **STOPCOCKS.** Hard rubber, bore ⅛ inch 1.00

4522J **STOPCOCKS.** Of glazed acid proof stoneware, straight or bent.

Bore	inches	⅜	½	¾	1
Price	each	$4.50	5.00	6.00	8.00

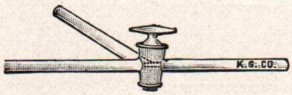
STOPCOCKS

No. 4523A



No. 4523B

No. 4523C



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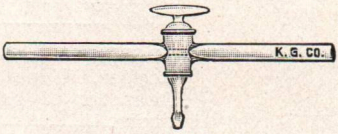


No. 4523F

No. 4523I

4523A **STOPCOCKS.** Geissler's. Glass. Type 8525.

Diam. of bore, m/m.	1	2	3	4	5	6	8
Each	$1.25	1.38	1.75	2.00	2.25	3.00	4.00

4523B **STOPCOCKS.** Geissler's. Glass, same as above, bent. Type 8530.

Diameter of bore ,m/m	1	2	3	4	5
Each	$1.25	1.38	1.75	2.00	2.25

4523C **STOPCOCKS.** Geissler's. Glass, with capillary side tubes. Type 8535.

Diameter of bore, m/m	1	2
Each	$1.38	1.50

4523D **STOPCOCKS.** Three-way. Glass. Type 8540.

Diameter of bore, m/m	2	3	4
Each	$1.75	2.00	2.25

4523E **STOPCOCKS.** Geissler's. Glass. Three-way, capillary side tubes. Type 8545.

Diameter of bore, m/m	2
Each	$2.25

4523F **STOPCOCKS.** Three-way. Glass, with downward outlet at end of stopper. Type 8550.

Diameter of bore, m/m	1	2
Each	$1.75	2.00

4523G **STOPCOCKS.** Geissler's. Glass, Three-way, with downward outlet at end of stopper, capillary side tubes. Type 8555.

Diameter of bore, m/m	1	2
Each	$3.00	3.13

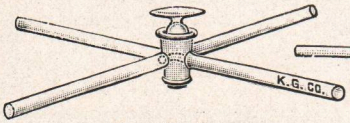
4523H **STOPCOCKS.** Two-way. Glass, with plug bore at an angle. Type 8560.

Diameter of bore, m/m	2
Each	$1.75

4523I **STOPCOCKS.** Two-way. Glass, with plug bore at an angle; capillary side tubes. Type 8565.

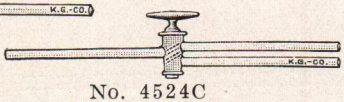
Diameter of bore, m/m	2
Each	$2.13

STOPCOCKS



No. 4524A

No. 4524B



No. 4524C

4524A **STOPCOCKS.** Four-way. Glass. Type 8570.

Diameter of bore, m/m	2	3	4
Each	$2.50	3.00	3.50

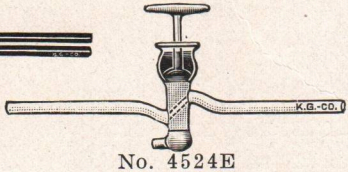
4524B **STOPCOCKS.** Three-way. Glass, with downward outlet at end of stopper. Type 8575.

Diameter of bore, m/m	2	4
Each	$2.25	3.60

4524C **STOPCOCKS.** Glass stopper with two oblique holes and two outlets on one side. Type 8580.

Diameter of bore, m/m	2	4
Each	$2.50	4.37

No. 4524D



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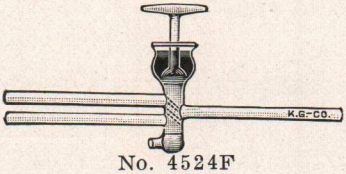


No. 4524F

4524D **STOPCOCKS.** Glass. Same as Type 8580, but capillary tubing, with 2 m/m bore. Type 8585.
Each $2.88

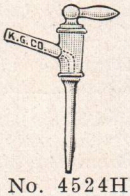
4524E **STOPCOCKS.** Two-way. Glass plug, bored at an angle and with mercury seal. Type 8590.

Diameter of bore, m/m	2	4
Each	$4.00	5.50

4524F **STOPCOCKS.** Three-way. Glass, same as above, but with two outlets on one side. Type 8595.

Diameter of bore, m/m	2	4
Each	$5.00	7.00

No. 4524H



No. 4524H

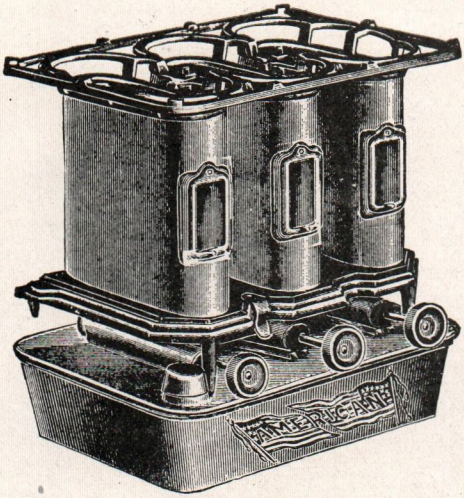
4524G **STOPCOCKS.** Glass. Straight, light weight, for making Burette tips. Type 8600.

Diameter of bore, m/m	1	2	3
Each	$1.38	1.50	1.75

4524H **STOPCOCKS.** Fresenius. Glass. Type 8605.

Diameter of bore, m/m	1	2
Each	$1.70	1.80

STOVES



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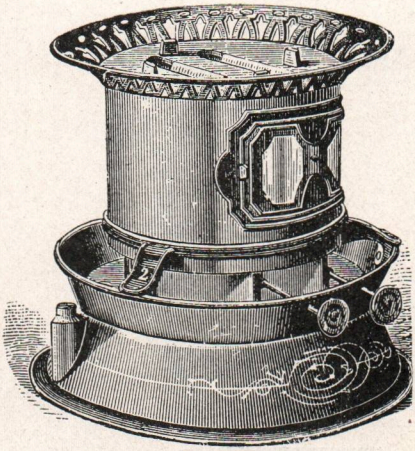


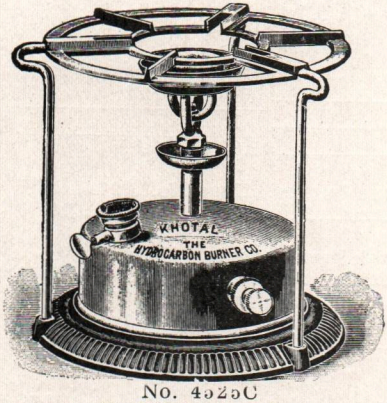
No. 4524B

4525A **STOVES,** for kerosene. "The American."

Width of burners ..... inches	4 3/8	4 3/8	4 3/8
No. of burners	1	2	3
Each	$2.25	3.25	4.25

4525B **STOVES,** for kerosene. "Improved Summer Queen," with water pan to keep oil reservoir cool.

Width of burners ..... inches	3	3	4
No. of burners	1	2	3
Each	$2.50	3.25	4.25



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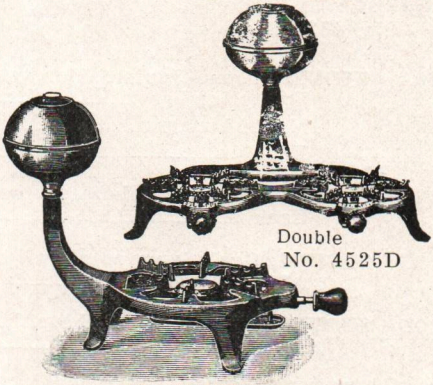


Double
No. 4525D

No. 4525D

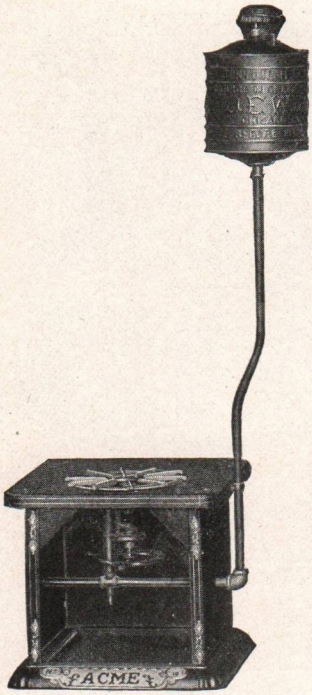
4525C **STOVES,** for kerosene. "Khotal." Of heavy polished brass, burns kerosene without a wick. Complete with detachable tripod frame, each $8.50

4525D **STOVES,** Barthel's, for Alcohol. Superior to most other alcohol stoves or lamps, as they manufacture their own gas by vaporizing the alcohol. No wick is used.

Price, single burner, japanned, each 6.50

Price, double burner, japanned, 2 1/4 pints capacity, each 8.50

STOVES



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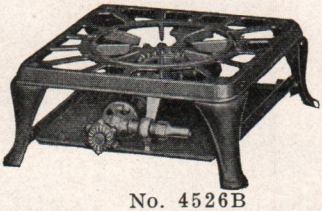

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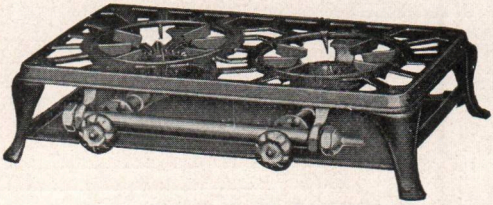


No. 4526C

4526A **STOVES,** Acme Junior. For gasoline.

Type Number	10	12	13
No. of burners	1	2	3
Each	$5.00	6.75	9.50

4526B **STOVES,** Gas. For laboratory use. One burner. Type No. A214.
Each $4.50

4526C **STOVES,** Gas. Same as above, but with two burners. Type No. A215. Each 7.50

4526D **STOVES,** Gas. Same as above, but with three burners. Type No. A216. Each 10.50

4526E **STOVE WICKS.**

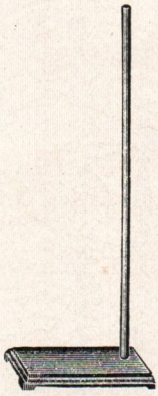
Width ..... in.	3	4	4⅜
Per dozen	$0.50	.75	.75

STOVES. See also burners and lamps, in index.

HOT PLATES AND WATER HEATERS. See index.

SULPHURATED HYDROGEN GENERATORS. See Gas Generators.

SUPPORTS



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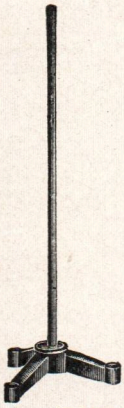

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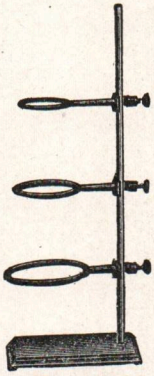

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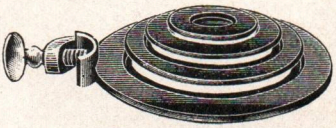


No. 4527I

No. 4527J

4527A **SUPPORTS, RECTANGULAR.** Base and rod only. For use with any clamp.

Size	Small	Medium	Large	Ex. Large
Base ....inches	4x6	5½x7½	6½x8½	6½x11
Rods ....inches	16	20	24	36
Each	$0.50	.75	1.10	1.60

4527B **SUPPORTS, Triangular.** Base and rod only. For use with any clamp.

Size	Small	Medium	Large	Ex. Large
Rods ....inches	16	20	24	36
Each	$0.50	.75	1.10	1.60

4527C **SUPPORTS,** Ring Stands. Rectangular, complete with rings.

Size	Small	Medium	Large	Ex. Large
Number of rings	2	3	4	4
Diam. of rings....inches	2, 3	2, 3, 4	2, 3, 4, 5	3, 4, 5, 6
Each	$1.00	1.65	2.50	3.00

4527D **SUPPORTS,** Ring Stands. Rectangular base, with extension rings and holders.

Size	Small	Medium	Large	Ex. Large
Number of rings	2	3	4	4
Diam. of rings....inches	2, 3	2, 3, 4	2, 3, 4, 5	3, 4, 5, 6
Each	$1.50	2.00	2.50	3.50

4527E **SUPPORTS,** Ring Stands. Triangular base, same as above.

Each	$1.25	1.75	2.25	2.75

4527F **SUPPORTS,** for Burettes. Iron base, rod and clamps.

With clamps	1	2	3
Each	$1.25	1.50	2.00

4527G **SUPPORT RINGS.** With brass screw to attach to supports.

Diameter.... inches	2	3	4	5	6
Each	$0.20	.25	.30	.35	.40

4527H **SUPPORT RINGS.** To attach with clamp holder.

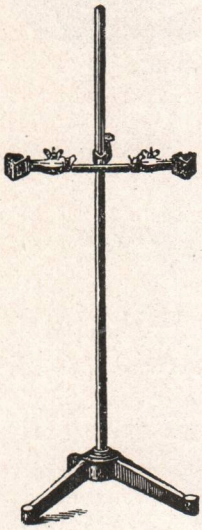
Diameter ....inches	2	3	4	5	6
Each	$0.15	.15	.20	.20	.25

4527I **SUPPORTS,** Concentric. Of iron, with clamp for attaching to retort stand.

Set of 3 rings, largest 6 inches....$1.00
Set of 4 rings, largest 8 inches.... 1.50

4527J **SUPPORTS.** Of cast iron, 5 inches diameter, with clamp for attaching to retort stand. May be used as a small hot plate, or support for Bunsen Burner, and for many other uses.
Each .... .75

SUPPORTS



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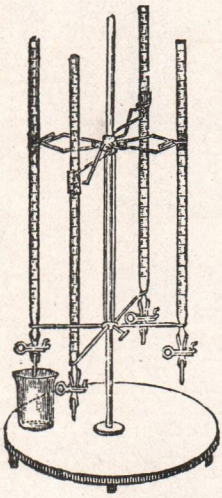

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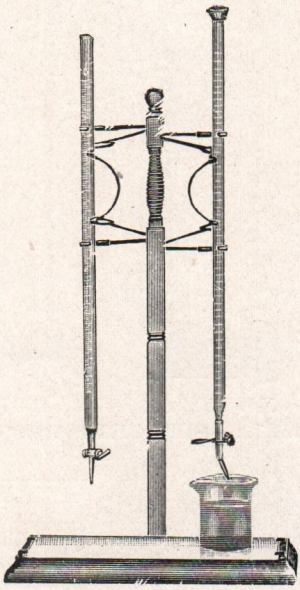


No. 4528C

4528A **SUPPORTS.** For burettes, iron, with one double Hoffman clamp.
Each ..... $ 2.00

4528B **SUPPORTS** for 4 Burettes. Solid porcelain base, revolving clamps, a very desirable support 12.50

4528C **SUPPORTS.** For burettes, Chaddock's.
Hardwood base with square milk glass plate, ground to write on, clamp of japanned spring wire on turned maple upright; thumb opens the rubber-covered V-shaped jaws, which close upon the burette and hold it firm and true.

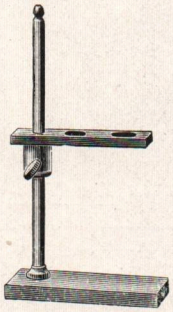
For burettes	1	2	3
Each	$2.75	3.75	5.75

4528D **EXTRA MILK GLASS PLATES.** For above.

1	2	3
$0.60	.75	1.00

SUPPORT RINGS, Iron. See Clamps.

SUPPORTS



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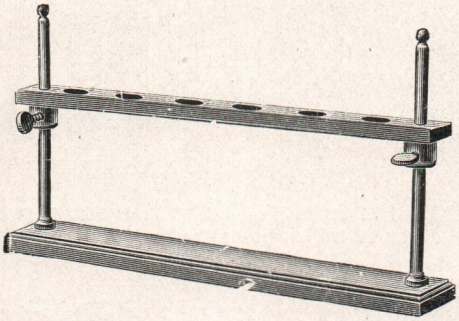

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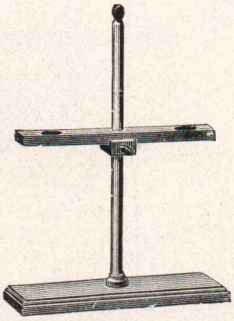
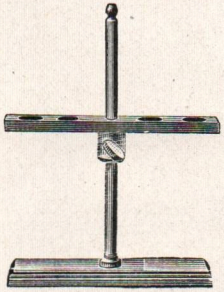


No. 4529C

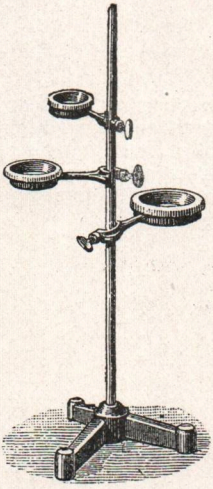
4529A **SUPPORTS.** For funnels, wood, 1 arm ..... $ .85

4529B **SUPPORTS.** For funnels; for 6 funnels in one row 3.00

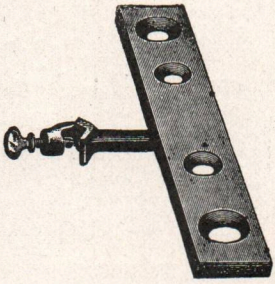
4529C **SUPPORTS.** For funnels, with double arm 2.00



No. 4529D



No. 4529E



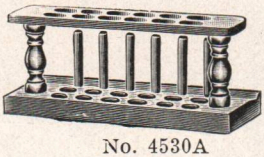
No. 4529F

4529D **SUPPORTS.** For funnels, wood, 1 double arm for 4 funnels $2.00

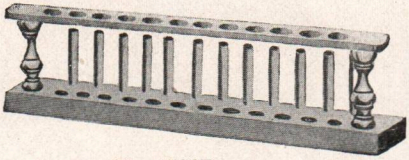
4529E **SUPPORTS.** For funnels, iron, with 3 wood-lined rings 3.00

4529F **SUPPORTS.** For funnels, hard wood, with iron clamp; for 4 funnels; can be attached to any retort stand 2.00

SUPPORTS

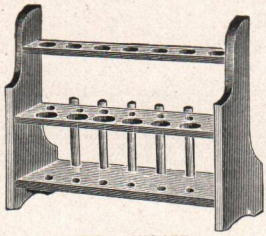


No. 4530A

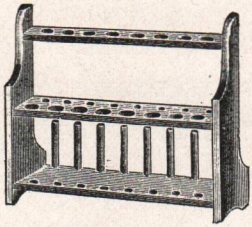


No. 4530B

4530A	Support Test Tube, for 12 tubes, 1⅛″ holes in two rows, with 12 pins	$1.35
4530B	Support Test Tube, for 12 tubes, holes 1⅛″	.75
4530C	Support Test Tube, for 12 tubes, holes ⅞″	.75
4530D	Support Test Tube, for 12 tubes, holes ¾″	.60
4530E	Support Test Tube, for 12 tubes, with 12 pins	[illegible]
4530F	Support Test Tube, for 10 tubes, with 10 pins	.60

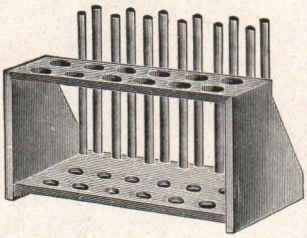


No. 4530K

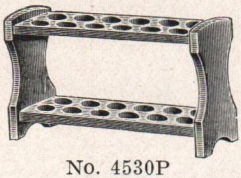


No. 4530J

4530G	Support Test Tube, K. D., for 16 tubes, with drying pins. Type 100	$0.75
4530H	Support Test Tube, K. D., for 25 tubes, with drying pins. Type 102	.95
4530I	Support Test Tube, for 25 tubes, with drying pins. Type 110	.75
4530J	Support Test Tube, for 16 tubes, with drying pins. Type 112	.75
4530K	Support Test Tube, for 13 tubes, with drying pins. Type 114	.85



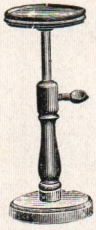
No. 4530O



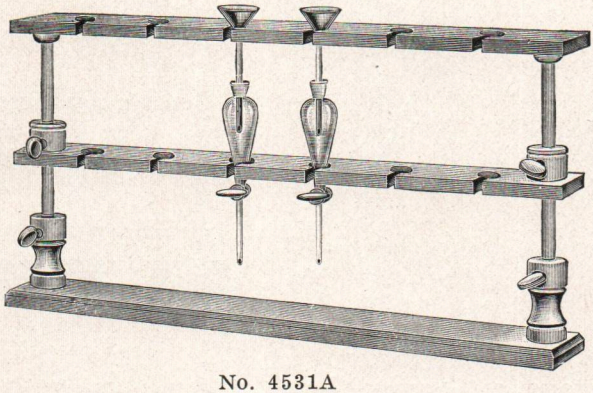
No. 4530P

4530L	Support Test Tube, for 6 tubes, with 6 pins	$0.45
4530M	Support Test Tube, for 4 tubes, with 4 pins	.40
4530N	Test Tube, rack 24 holes ½″ (for Wassermann tests)	.75
4530O	Support Test Tube, for 12 tubes, 12 pins, 10 holes $\frac{15}{16}$″, 2 holes 1⅛″, and drain groove	.80
4530P	Support Test Tube, for 12 tubes in two rows, with 6 pins and drain groove	.75
4530Q	Support Test Tube, for drying test tubes, with 50 pins	1.35
4530R	Support Test Tube, for drying test tubes, with 25 pins	.85

SUPPORTS



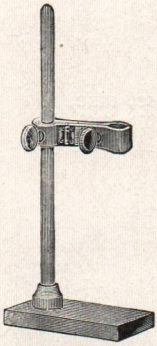
No. 4531K



No. 4531A

No. 4531L

4531A Support Separatory Funnel, as described by Dr. A. E. Leach in his work on Food Inspection and Analysis. Type 2, each $6.00



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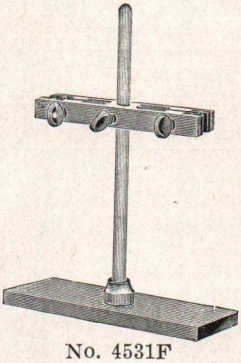
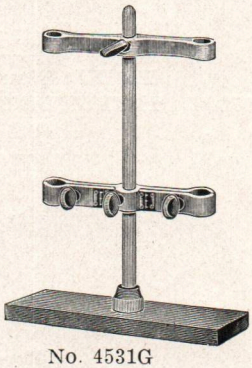


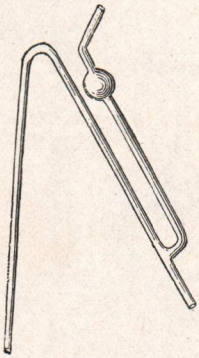
No. 4531F



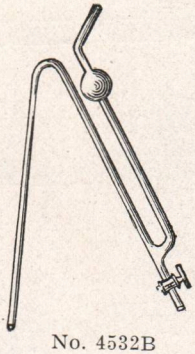
No. 4531G

4531B Support-Burette, cork lined, for one burette. Type No. 40 ..... $1.00
4531C Support-Burette, cork lined, for two burettes. Type No. 42 ..... 1.25
4531D Support-Burette, cork lined, for two burettes, with stearying arm. Type No. 44 ..... 1.50
4531E Support-Burette, cork lined, for one burette. Type No. 46 ..... 1.10
4531F Support-Burette, cork lined, for two burettes. Type No. 48 ..... 1.35
4531G Support-Burette, cork lined, for two burettes, with steadying arm. Type No. 50 ..... 1.60
4531H Support-Burette, cork lined, for four burettes. Type No. 52 ..... 1.50
4531I Tube Holder. Type No. 60 ..... 3.00
4531J Tube Holder. Type No. 62 ..... 5.00
4531K Support-Table, base leaded, 10″ and 15″ high. Type No. 64 ..... 1.50
4531L Support-Pipette, revolving, for 12 pipettes. Type No. 66 ..... 2.50
4531M Burette Holder, for two burettes. This is very convenient, for it is easily attached to re-agent shelf, and when not in use can be turned up out of the way 5.00

SYPHONS, TEST TUBE RACKS, ETC.



No. 4532A



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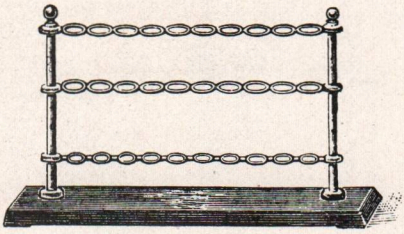


No. 4532C

4532A **SYPHONS,** Glass. With suction tube. Type 8640.

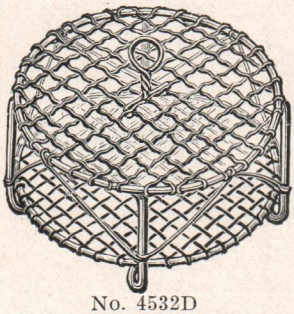
Length ....in.	8	12	18	24	30
Each	$0.45	.50	.80	1.25	1.75

4532B **SYPHONS,** Glass. With Geissler's glass stopcock and suction tube. Type 8645.

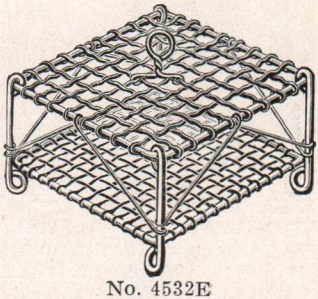
Length ....in.	8	12	18	24	30
Each	$1.50	1.80	2.75	3.00	3.60

TANKS, Blow Pipe. See Furnaces.

4532C **TEST TUBE RACK.** Nickel-plated, on japanned iron base, size, 6 inches high, 11 inches long, for 10 test tubes. Type No. 140.
Each $2.00



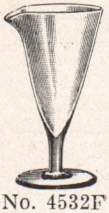
No. 4532D



No. 4532E

4532D **TEST TUBE RACK.** Round form, tinned wire, size, 7 inches in diameter by 3½ inches high. Type No. 1402. Each.... $1.00

4532E **TUBE RACK.** Square form, tinned wire, size, 7 inches by 7 inches, 3½ inches high. Type No. 1403. Each $1.00



No. 4532F

4532F **TEST GLASSES.** With lip, coming to fine evenly coned point.

Capacity ....oz.	1	2	4	6	8
Each	$0.60	.70	.80	.90	1.00

TEST PAPERS

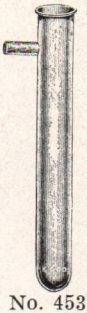
No. 4354H

No. 4354I

4533A	**TEST PAPER,** Litmus, in books, red	Per book	$ .08
4533B	**TEST PAPER,** Litmus, in books, blue	Per book	.08
4533C	**TEST PAPER,** Litmus, in vials, red	Per vial	.12
4533D	**TEST PAPER,** Litmus, in vials, blue	Per vial	.12
4533E	**TEST PAPER,** Litmus, in vials, neutral	Per vial	.15
4533F	**TEST PAPER,** Litmus, tape form, in metal box	Per box	.20
4533G	**TEST PAPER,** Litmus, tape form, in metal box	Per box	.20
4533H	**TEST PAPER,** Congo, tape form, in metal box	Per box	.20
4533I	**TEST PAPER,** Tumeric, tape form, in metal box	Per box	.20
4533J	**TEST PAPER,** Litmus, in sheets, red	Per quire	.75
4533K	**TEST PAPER,** Litmus, in sheets, blue	Per quire	.75
4533L	**TEST PAPER,** Litmus, in sheets, neutral	Per quire	.75
4533M	**TEST PAPER,** Tumeric, in sheets	Per quire	.75
4533N	**TEST PAPER,** Potassium Iodide, in sheets	Per quire	1.25
4533O	**TEST PAPER,** Lead Acetate, in sheets	Per quire	1.00
4533P	**TEST PAPER,** Methyl Orange, in sheets	Per quire	1.00
4533Q	**TEST PAPER,** Congo, in sheets	Per quire	.75
4533R	**TEST PAPER,** Phenolphtalein, in sheets	Per quire	1.25
4533S	**TEST PAPER,** Iodide of Starch, in sheets	Per quire	1.25

TEST TUBES

No. 4534A


No. 4534B

No. 4534C

No. 4534D

4534A **TEST TUBES.** Well annealed, suitable for all ordinary laboratory uses where a resistant glass is not required. Type 8900.

8945.							
Length, inches					3	3	4
Diameter, inches					½	1	½
Gross					$2.10	3.00	2.15
Length, inches				5	5	6	6
Diameter, inches				½	⅝	¾	½	⅝
Gross				$2.40	2.60	2.85	2.75	2.85
Length, inches		6	6	6	7	7	7	7
Diameter, inches		¾	⅞	1	½	¾	⅞	1
Gross	$3.00	3.90	4.55	3.25	4.65	5.20	5.85
Length, inches		8	8	9	10	11	12
Diameter, inches		¾	1	1	1	1	1
Gross		$5.50	6.50	7.80	8.45	11.70	16.25

4534B **TEST TUBES.** With side neck. Type 8910.

Length, inches	5	6	7	8	9
Diameter, inches	⅝	¾	⅞	1	1
Dozen	$1.30	1.45	1.55	1.80	2.35

4534C **TEST TUBES.** With lip and foot. Type 8915.

Length, inches	3'	4	5	6	7
Diameter, inches	⅜	½	⅝	¾	⅞
Dozen	$0.60	.65	1.20	1.50	1.95
Diameter, inches	8	9	10	11	12
Length, inches	1	1	1	1	1
Dozen	$2.60	3 25	3.75	4.55	5.85

4534D **TEST TUBES.** Graduated, with lip but without foot. Type 8940.

Capacity, cc.	5	10	15	20	25	30
Graduated into, cc.	1/10	1/10	1/10	1/10	1/10	1/5
Each	$0.24	.30	.36	.45	.48	.54

4534E **TEST TUBES.** Graduated, same as Type 8940, with lip, on foot. Type 8945.

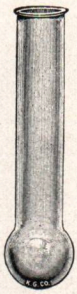
Capacity, cc.	5	10	15	20	25	30
Graduated into, cc.	1/10	1/10	1/10	1/10	1/10	1/5
Each	$0.42	.48	.54	.63	.66	.72

TEST TUBES

No. 4535A

No. 4535B

No. 4535C


No. 4535D

4535A **TEST TUBES.** Bulb near top. Kollegiate Glass; prevents contents from boiling over and may be laid down without overflowing. Type 8920.

Length, inches	5	6
Diameter, inches	⅝	¾
Dozen	$1.75	2.00

4535B **TEST TUBES.** Made of special hard glass, very heavy wall, with slight lip. Type 8960.

Length, inches	4	5	6	8	10
Diameter, inches	⅝	⅝	¾	1	1
Dozen	$1.65	2.00	2.50	4.20	5.00

4535C **TEST TUBES.** Ignition. Made of special hard glass, heavy wall, without lip, round bottom. Type 8965.

Length, inches	4	5	6	7	8
Diameter, inches	½	⅝	¾	⅞	1
Gross	$5.25	6.00	6.60	9.00	12.75

4535D **TEST TUBES.** Ignition. Made of special hard glass, heavy wall, with lip and bulb. Type 8970.

Length, inches	4	5	6	7	8
Diameter, inches	½	⅝	¾	⅞	1
Gross	$6 00	6.75	7.50	10.10	13.85

4535E **TEST TUBES.** Bacteriological Culture. Without lip, flat bottom, made of medium weight glass. Type 8925.

Length, inches	4	5	6	7	8
Diameter, inches	½	⅝	¾	⅞	1
Gross	$3.15	3.60	3.90	6.75	8.25

4535F **TEST TUBES.** Bacteriological Culture. Without lip, round bottom, made of medium weight glass. Type 8930.

Length, inches	4	5	6	7	8
Diameter, inches	½	⅝	¾	⅞	1
Gross	$3.15	3.60	3.90	6.75	8.25

TUBES

No. 4536A

No. 4536D

No. 4356F

4536A **TUBES.** Centrifuge. Ungraduated. Capacity, 10 cc. Type 8725.
Each $0.08

4536B **TUBES.** Centrifuge. Ungraduated. Capacity, 15 cc. Type 8730.
Each ..... .08

4536C **TUBES.** Centrifuge. Ungraduated. Capacity, 50 cc. Type 8735.
Each ..... .17

4536D **TUBES.** Centrifuge. Graduated to 10 cc. Type 8740. Each.... .30

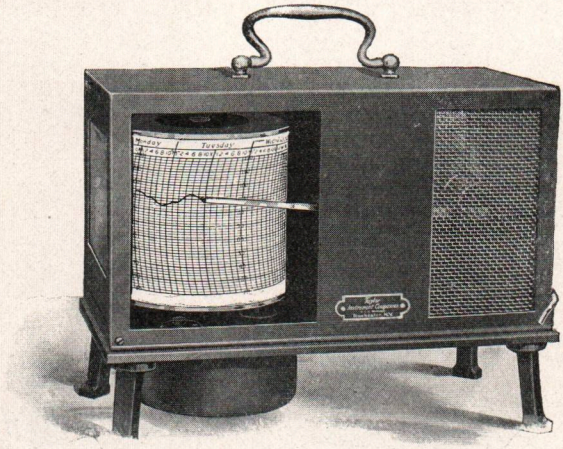
4536E **TUBES.** Centrifuge. Graduated to 15 cc. Type 8745. Each.... .34

4536F **TUBES.** Centrifuge. Graduated to 10 cc. and ungraduated from 10 cc. mark to 15 cc. Type 8750. Each ..... .32

4536G **TUBES.** Centrifuge. Graduated to 50 cc. Type 8755. Each.... .50

THE *Tycos* THERMOGRAPH

(American Manufacture)



No. 4537D

Length 10″, height 8″, width 5″

Weight Approx. 8 lbs.

The *Tycos* Thermograph (Recording Thermometer) is arranged to create upon a chart a continuous seven-day record of temperature.

This chart is dvided into days and two-hour subdivisions of each day. Horizontally the dividing lines are in degrees of temperature.

An arm carrying the recording pen is connected directly with a coil, which changes as the temperature rises or falls. This causes the arm, with the recording pen attached, to move vertically over the chart.

The pen is filled with a prepared ink, and rests against the chart, thus creating the record.

The mechansim is extremely simple and durable. It is non-corrosive, and is so arranged that no levers other than the pen arm are used to convey the movement of the coil (caused by changes of temperature) to the record chart.

This construction overcomes all lag, creep and friction. Changes of less than ½° F. are easily discernible.

They are more sensitive than most mercurial thermometers, yet their construction is most rugged.

Charts showing a variety of ranges can be secured to suit individual requirements. Standard charts are as follows:

4537A Ranged from zero to ×100° Fahrenheit. Type 84 ..... $2.00

4537B Ranged from ×20° to ×120° Fahrenheit. Type 85 ..... 2.00

4537C Ranged from —10° to ×90° Farenheit. Type 86 ..... 2.00

As all these charts show ranges of temperature equal to 100° Fahrenheit, they are interchangeable.

4537D Price, each $55.00

THERMOMETERS

No. 4538A
Chemical
In Wood Case

No. 4538B
Technical
In Armored Case

No. 4538C
Floating
Dairy

In making your purchases of thermometers, consider quality first. There are as many great variances in the grades of thermometers as in any known instrument, We handle only the best standard makes and recommend them where extreme accuracy is essential.

THERMOMETERS

4539A **THERMOMETERS,** Chemical. Scale Engraved on Stem, with white enamel back; plain mercury tubes, good grade; in wooden case.

Grad. to	—10+110	150	200	350°C.
Each	$1.40	1.50	2.00	2.50
Grad. to	—20+120	220	400	650°F.
Each	$1.40	1.50	2.00	2.50

4539B **THERMOMETERS,** Chemical. Milk Glass Scale, enclosed in glass tube; in wooden case.

Grad. to	—10+110	200	350°C.
Each	$1.10	1.50	1.75
Grad. to	220	400	650°F.
Each	$1.10	1.50	1.75

4539C **THERMOMETER.** Sugar. 12 inch copper cup case, silvered brass scales, black figures, approximate scale range 0° to 150°C. Each ..... $ 3.00

4539D **THERMOMETER,** Calorimeter. All glass, with scale etched on stem, graduated in 1-10 degrees. Length, 18 inches; range 60° to 110° Fahrenheit. Made in accordance with recommendations of Committee on Calorimetry of American Gas Institute. Furnished with certificate of test by comparison with U. S. Bureau of Standards instruments. Each 21.60

4539E **THERMOMETERS,** Chemical. Same grade as 4539A, with two scales engraved on the Stem.
Registering 110°C. and 220°F. $1.75
Registering 200°C. and 400°F. 2.50
Registering 350°C. and 650°F. 3.50

4539F **THERMOMETERS.** Chemical. Standard grade. Filled with Nitrogen to prevent the separation of Mercury, Engraved on Stem, 0 to 400°C. or +30 to 750°F. ..... $ 5.75

4539G **THERMOMETERS,** Normal. Standard grade. Filled above Mercury with Carbonic Acid. Graduated on Tube 0 to 540°C. or +30—1000°F. 10.00

4539H **THERMOMETER,** Candy. Especially recommended for domestic science work. A copper case, 8-inch silvered brass scale; adjustable metal clip on the back for fastening to any depth cooking vessel, with wood handle permitting handling of Thermometer without danger of burning fingers. Approximate scale range 100° to 360°F. Each 1.25

4539I **THERMOMETERS.** Technical. In Armored Case to protect stem end lessen liability of breakage.

Grad. to	150°C.	220°F.	300°C.	600°F.
Each	$4.50	4.50	5.00	5.00

4539J **ARMORED CASES,** only, for above, each 2.70

4539K **THERMOMETERS,** Floating. Dairy, 0-150° F. Each 2.00

4539L **THERMOMETERS.** Floating. Paper Scale, 10 inches long, 110° F. or 220° F. 2.00

4539M **THERMOMETERS,** Brewer's. 12 inches long, Copper Cup Case, 220°F+R 3.25

We can supply thermometers of any other kind or range upon request.

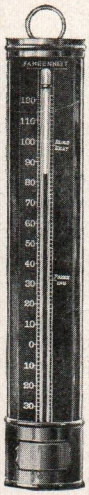
Tycos THERMOMETERS

SOLID GLASS, ENGRAVED THERMOMETERS

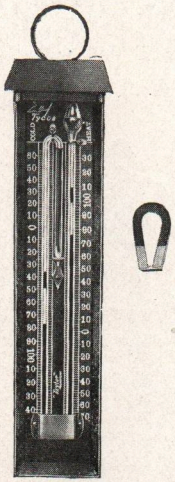
Guaranteed for Accuracy. Aged Tubes

		Each
4540A	30 cm. **FLASH AND FIRE TEST THERMOMETERS,** for low flashing oils, scaled minus 10° to 110° C., in 1° divisions. According to the specifications of the American Society of Testing Materials. Type 1775	$ 2.75
4540B	15″ **FLASH AND FIRE TEST THERMOMETER,** scaled 20° to 220° F. in 1° divisions. Pointed for 1″ immersion. Type 1768	2.75
4540C	Same as Type 1768, except scaled 20° to 300° F. in 1° divisions. Type 1769.	2.90
4540D	Same as Type 1768, except scaled 20° to 400° F. in 2° divisions. Type 1770	3.60
4540E	Same as Type 1768, except scaled 20° to 500° F. in 2° divisions. Type 1771.	4.35
4540F	Same as Type 1768, except scaled 20° to 600° F. in 2° divisions. Type 1772.	5.05
4540G	Same as Type 1768, except scaled 20° to 720° F. in 2° divisions. Type 1773.	5.50
4540H	Same as Type 1768, except scaled 20° to 760° F. in 2° divisions. Type 1774.	6.30
4540I	15″ **DISTILLATION THERMOMETER,** scaled 30° to 400° F. in 2° divisions. Pointed for 3″ immersion. Type 1791	4.50
4540J	38 cm. **DISTILLATION THERMOMETER,** for Gasoline, 0° to 270° C. in 1° divisions. Specifications of The Bureau of Mines, Department of the Interior. Type 1428	4.50
4540K	Same as Type 1428, except 20° to 520° F. in 2° divisions. Type 1428A.	4.50
4540L	15″ **DISTILLATION THERMOMETER,** scaled 30° to 750° F. in 2° divisions. Pointed for 3″ immersion. Type 1792.	9.00
4540M	38 cm. **DISTILLATION THERMOMETER,** for Turpentine Substitutes and Creosote, scaled 0° to 400° C. in 1° divisions. According to the specification of the American Society of Testing Materials. Type 1427	9.00
4540N	16″ **HIGH TEMPERATURE THERMOMETER,** scaled 100° to 950° F. in 5° divisions. Pointed for 3″ immersion. Type 1407.	10.00
4540O	Same as Type 1407, except scaled 0° to 510° C. in 2° divisions. Type 1414.	10.00
4540P	10″ **WAX TEST THERMOMETER,** scaled 80° to 150° F. in ¼° divisions, for determining the melting point of Waxes, Paraffins and Greases. Type 1784.	3.60
4540Q	8¾″ **COLD TEST THERMOMETER,** scaled —20° to 140° F. in 2° divisions, for determining the congealing point of lubricating oils. Type 1785.	2.75
4540R	15″ **TITER TEST THERMOMETER,** scaled 0° to 65° C. in 1/10° divisions, made according to standard specifications. Type 1425.	11.00
4540S	**VISCOSITY THERMOMETER,** scaled 98° to 108° F. in 1/5° divisions, for taking viscosities at 100° F. Type 1788	5.50
4540U	Same as Type 1787, except scaled 208° to 218° F. in 1/5 divisions, for taking viscosities at 212° F. Type 1789	5.50
4540V	**VISCOSITY THERMOMETER,** scaled 55° to 110° F. in 1° divisions. Type 1763	2.75
4540W	Same as Type 1763, except scaled 80° to 110° F. Type 1764	2.75
4540X	Same as Type 1763, except scaled 100° to 150° F. Type 1765	2.75
4540Y	Same as Type 1763, except scaled 100° to 220° F. Type 1766	2.75
4540Z	Same as Type 1763, except scaled 180° to 220° F. Type 1767	2.75

HOUSEHOLD THERMOMETERS



No. 4541A
Tin Case



No. 4541B
Maximum and Minimum

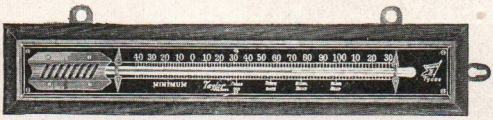
4541A Heavy tin case Thermometers for inside or outside use, especially serviceable wherever an instrument is subjctd to rough treatment. Mercury bulb fully protected. Scale range, 10 to 40° below zero; for mercury tubes and 20 to 60° below for spirit tubes to 120°F. above. Type 5400.

Size	inches	8	10	12
Price	each	$1.25	1.50	1.75

4541B Maximum and minimum self registering with magnet for resetting—absolutely accurate, scale range, 10 to 40° below zero to 120°F. above zero. Black oxidized brass scales, white filled figures, black japanned tinned case. Type 5452.

Size	inches	8	10
Price	each	$4.50	5.00

NOTE—The Thermometers listed above are Standard quality and permanently accurate. We can furnish cheaper grades but do not recommend their use.



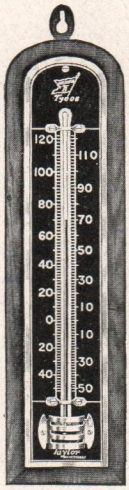
No. 4541C

4541C Minimum self-registering Thermometer, golden oak back, oxidized brass scales, white filled figures. Type 5500.

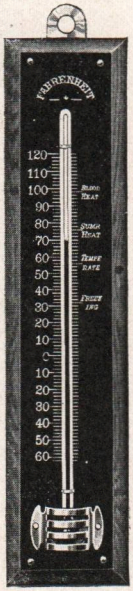
Size	inches	10
Price	each	$1.75

HOUSEHOLD THERMOMETERS

Cabinet



No. 4542A



No. 4542B

STANDARD GRADE

Special hand rub piano finish thin wood back, in mahogany, birdseye maple or golden oak. Black oxidized brass beveled-edged scales, silver deposited figures and graduations, bronze screw clasps and guards, magnifying mercury or *spirit seasoned tubes; scale range, about +20° to 100°F. Sensible thermometer for indoor use.

MAHOGANY OR BIRDSEYE MAPLE BACK OR GOLDEN OAK

Type 5100S

4542A Price, 6-inch $1.50

Price, 8-inch 1.75

Price, 10-inch 2.25

OAK BEVEL EDGE BACK, ORDINARY GRADE

Type 5120S

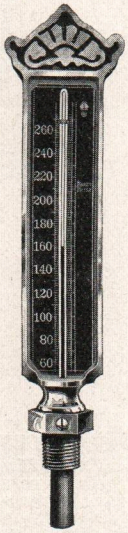
4542B Price, 8-inch $1.00

Magnifying mercury or *spirit tubes, black oxidized brass scales, white filled figures, nickeled straps and guards; scale ranging from 10 to 40° below zero to 120° F. above.

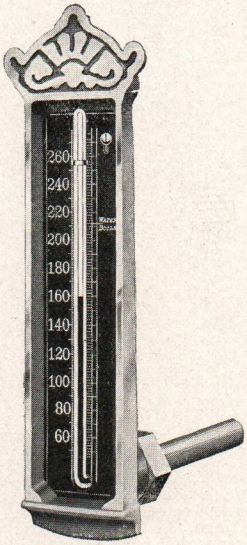
*If spirit tubes are desired, designate by letter "S."

THERMOMETERS

HOT-WATER



No. 4543A
Straight

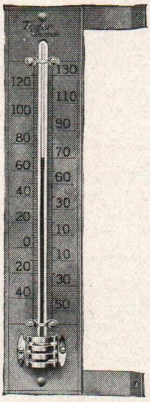


No. 4543C
Angle

Iron nickel-plated case, brass oxidized scales, white filled figures, 8-inch case, 2-inch stem, ½-inch S. P. thread. Approximate scale range, 60 to 260°F.

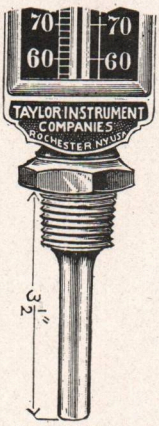
No.		Price
4543A	Straight Stem, Magnifying Mercury Tubes. Type 6040	$1.50
4543B	Straight Stem, Magnifying Red Liquid Tubes. Type 6041	1.50
4543C	Angle Stem, Magnifying Mercury Tubes. Type 6042	2.00
4543D	Angle Stem, Magnifying Red Liquid Tubes. Type 6043	2.00

WINDOW THERMOMETERS

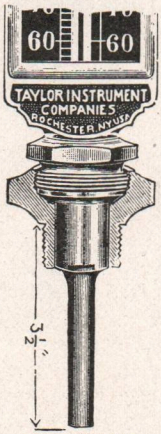


4543E Magnifying, permacolor-filled tubes, mounted on zinc scale; black figures and graduations; 10″ long. Type 5315 ..... $1.25

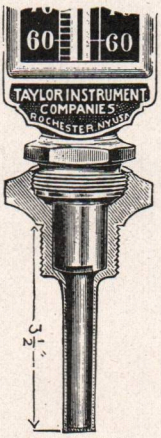
INDUSTRIAL THERMOMETERS



No. 4544A



No. 4544D



No. 4544G

STRAIGHT STEM INDUSTRIAL THERMOMETERS

Fixed Connection Glass. Threaded for ¾-in. Pipe Tap

The Straight Stem Industrial Thermometers listed herewith are standardized patterns, with scales graduated in the different stock temperature ranges enumerated and with stem lengths as shown. In design and construction they are adapted to conditions where the heat medium is water, steam, vapor, oil or other liquids.

Thermometers as listed, except graduated for other temperature ranges, if practicable in the scale size desired, will be furnished at same prices when temperature ranges are within the limits of 40° below zero and 750° above, Fahrenheit.

STOCK TEMPERATURE RANGES

Graduations in 1°, 2° or 5° Spacings

Approximate Scale 0°—120°, 30°—160°, 40°—240°, 50°—400°, 170°—270°, 200°—350° Fahrenheit.

WITH THREAD CONNECTION

4544A **STRAIGHT STEM INDUSTRIAL THERMOMETER,** with 12-inch scale graduated for temperature range selected. Type 100 ..... $22.50

4544B **STRAIGHT STEM INDUSTRIAL THERMOMETER.** Same as Type 100, except with 9-inch scale. Type 101 ..... 18.00

4544C **STRAIGHT STEM INDUSTRIAL THERMOMETER.** Same as Type 100, except with 7-inch scale. Type 102 ..... 13.50

WITH UNION CONNECTION

4544D **STRAIGHT STEM INDUSTRIAL THERMOMETER.** With 12-inch scale, graduated for temperature range selected. Type 103 ..... 27.00

4544E **STRAIGHT STEM INDUSTRIAL THERMOMETER.** Same as Type 103, except with 9-inch scale. Type 104 ..... 22.50

4544F **STRAIGHT STEM INDUSTRIAL THERMOMETER.** Same as Type 103, except with 7-inch scale. Type 105 ..... 18.00

WITH SEPARATE SOCKET CONNECTION

4544G **STRAIGHT STEM INDUSTRIAL THERMOMETER.** With 12-inch scale, graduated for temperature range selected. Type 106 ..... 31.50

4544H **STRAIGHT STEM INDUSTRIAL THERMOMETER.** Same as Type 106, except with 9-inch scale. Type 107 ..... 27.00

4544I **STRAIGHT STEM INDUSTRIAL THERMOMETER.** Same as Type 106, except with 7-inch scale. Type 108 ..... 22.50

Union and Separable Socket Connection Thermometers with 9 and 12-inch scale are also stocked in Temperature Range of 200°—750° Fahrenheit.

Centigrade Scale

Types 100 to 108 will be furnished graduated in Centigrade without extra charge.

GREATER LENGTH STEM

With Thread Connection

4544J For stem 6 inches long including threaded portion 2.70

4544K For each additional 6 inches or fraction thereof 2.70

With Union Connection

4544L For stem over 6 inches long, each additional 6 inches or fraction thereof 2.70

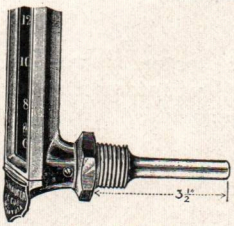
With Separate Socket Connection

4544M For stem 6 inches long including threaded portion 4.50

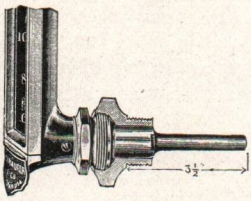
4544N For each additional 6 inches or fraction thereof 4.50

INDUSTRIAL THERMOMETERS

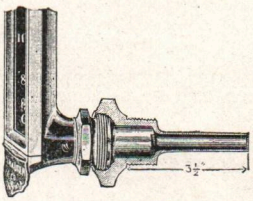
ANGLE STEM INDUSTRIAL THERMOMETERS



No. 4545A



No. 4545D



No. 4545G

Fixed Connection Glass. Threaded for ¾-in. Pipe Tap

The Angle Stem Industrial Thermometers listed herewith are standardized patterns with scales graduated in the different stock temperature ranges enumerated and with stem lengths as shown.

In design and construction they are adapted to conditions where the heat medium is water, steam, vapor, oil or other liquids.

Thermometers as listed except graduated for other temperature ranges, if practicable in the scale size desired, will be furnished at same prices when temperature ranges are within the limits of 40° below zero and 750° above Fahrenheit.

STOCK TEMPERATURE RANGES

Graduations in 1°, 2° or 5° Spacings

Approximate Scale 0°—120°, 30°—160°, 40°—240°, 50°—400°, 170°—270°, 200°—350° Fahrenheit.

WITH THREAD CONNECTION

4545A **ANGLE STEM INDUSTRIAL THERMOMETER.** With 12-inch scale. Type 114 ..... $27.00

4545B **ANGLE THERMOMETER.** As Type 114, except 9-inch scale. Type 115. 22.50

4545C **ANGLE THERMOMETER.** As Type 114, except 7-inch scale. Type 116. 18.00

WITH UNION CONNECTION

4545D **ANGLE THERMOMETER,** with 12 -inch scale. Type 117 ..... 31.50

4545E **ANGLE THERMOMETER.** As Type 117, except 9-inch scale. Type 118. 27.00

4545F **ANGLE THERMOMETER.** As Type 117, except 7-inch scale. Type 119. 22.50

WITH SEPARABLE SOCKET CONNECTION

4545G **ANGLE THERMOMETER.** With 12-inch scale: 1-inch pipe threaded socket. Type 120 ..... 36.00

4545H **ANGLE THERMOMETER.** As Type 120, except 9-inch scale. Type 121. 31.50

4545I **ANGLE THERMOMETER.** As Type 120 except 7-inch scale. Type 122... 27.00

Union and Separable Socket Connection Thermometer with 9 and 12-inch scale are also stocked in Temperature Range of 200°—750° Fahrenheit.

CENTIGRADE SCALE

Types 114 to 122 will be furnished graduated in Centigrade without extra charge.

GREATER LENGTH STEM

With Thread Connection

		Add to List
4545J	For stem 6 inches long including threaded portion	2.70
4545K	For each additional 6 inches or fraction thereof	2.70
	With Union Connection	
4545L	For stem over 6 inches long ,each additional 6 inches or fraction thereof	2.70
	With Separable Socket Connection	
4545M	For stem 6 inches long including threaded portion	4.50
4545N	For each additional 6 inches or fraction thereof	4.50

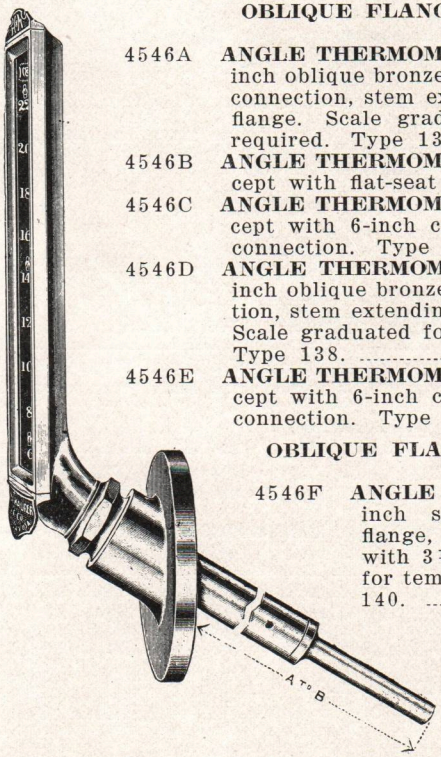
Types 117, 118, 120 and 121 can be furnished with incling or reclining face without extra charge.

ANGLE THERMOMETERS

WITH OBLIQUE FLANGE UNION CONNECTION

When ordering(state specific use for which thermometer is wanted. Specifications must also give the degree of angle formed by intersection of center line of thermometer stem with vertical surface of apparatus.

Prices listed cover temperature ranges within the limits of 40° below zero and 750° above zero, Fahrenheit.



No. 4546A

OBLIQUE FLANGE UNION CONNECTION

		Each
4546A	**ANGLE THERMOMETER.** With 12-inch scale, 6-inch oblique bronze flange, taper-shank seat union connection, stem extending 6 inches from face of flange. Scale graduated for temperature range required. Type 135	$16.80
4546B	**ANGLE THERMOMETER.** Same as Type 135, except with flat-seat union connection. Type 136	39.60
4546C	**ANGLE THERMOMETER.** Same as Type 135, except with 6-inch cast-iron flange, flat-seat union connection. Type 137	36.90
4546D	**ANGLE THERMOMETER.** With 9-inch scale; 6-inch oblique bronze flange, flat-seat union connection, stem extending 6 inches from face of flange. Scale graduated for temperature range required. Type 138.	35.10
4546E	**ANGLE THERMOMETER.** Same as Type 138, except with 6-inch cast-iron flange, flat-seat union connection. Type 139	32.40

OBLIQUE FLANGE SEPARABLE SOCKET CONNECTION

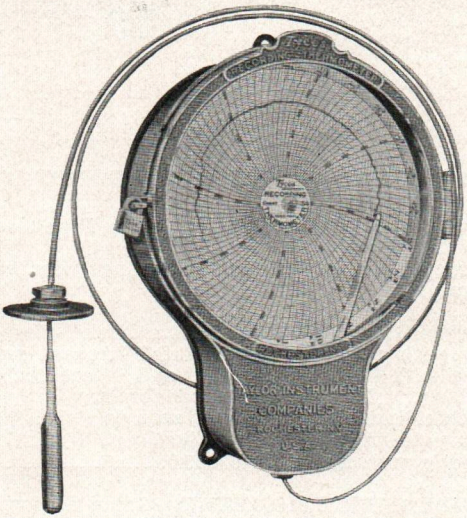
4546F	**ANGLE THERMOMETER.** With 12-inch scale; 6-inch oblique bronze flange, separable socket connection with 3½-inch stem. Scale graduated for temperature range required. Type 140.	44.10
4546G	**ANGLE THERMOMETER.** Same as Type 140, except with 9-inch scale. Type 141.	39.60

EXTRAS

		Add to List
4546H	Longer Stem with Union Connection, each additional 6 inches or fraction thereof	2.70
4546I	Longer Stem with Separable Socket Connection each additional inches or fraction thereof	4.50

Tycos RECORDING THERMOMETER

Dial Type



No. 4547A

4547A The *Tycos* Recording Thermometer is of attractive and compact design, finished in dull black enamel.

The high grade clock movement is designed to meet the exacting requirements of this instrument and is housed in a lacquered drawn-brass dust-proof box.

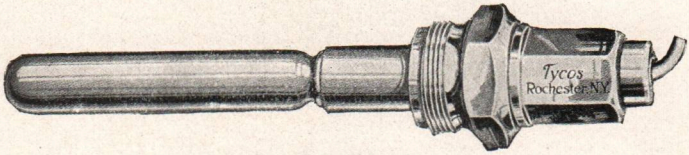
The flexible capillary connecting tube is finished in nickel, practically indestructible and therefore requires no protecting covering or armor.

The actuating medium is mercury, which is practically incompressible, will not permeate metal, remains unchanged after years of continued use, has a range of 40° below zero to 1000° above zero, Fahrenheit, and a uniform co-efficient of expansion.

The scale graduation of the chart is as wide as on other so-called "12-inch" charts and the divisions are uniform through the entire range.

The Patented Pen Arm Seal prevents adjustment by unauthorized persons and therefore makes the *Tycos* Recorder "Tamper-Proof."

Tycos RECORDING THERMOMETER



No. 4548A

DIAL TYPE

BULB STEM WITH UNION CONNECTION

No. 512 Hub Threaded for ¾-inch Pipe

When ordering state length of connecting tubing, number of chart and full details of application.

4548A **TYCOS RECORDING THERMOMETER.** Nickel-plated cast-iron case with polished nickel-plated bronze front-ring. Bulb Stem with Union Connection and 6 feet flexible capillary tubing. Chart as selected for any temperature range within limits of 40° below zero to +500° Fahrenhelt. Complete with 100 charts, bottle of Tycos Recorder ink and lock with key. Type 8010 ..... $ 97.25

4548B **TYCOS RECORDING THERMOMETER.** Same as Type 8010, except with chart as selected for any temperature range not exceeding 800° Fahrenheit. Type 8011 ..... 108.00

4548C **TYCOS RECORDING THERMOMETER.** Same as Type 8010, except with chart as selected for any temperature range not exceeding 1000° Fahrenheit. Type 8012 ..... 122.50

4548D **TYCOS BI-RECORDING THERMOMETER.** Nickel-plated cast-rion case with polished nickel-plated bronze front-ring. Bulb Stem with Union Connection and 6 feet connecting tubing on each tube system. Chart as selected for any temperature range within limits of 40° below zero to +500° Fahrenheit. Complete with 100 charts, 2 bottles of Tycos Recorder Ink and lock with key. Type 8070. ..... 146.00

4548E **TYCOS BI-RECORDING THERMOMETER.** Same as Type 8070, except with chart as selected for any temperature range not exceeding 800° Fahrenheit. Type 8071. ..... 162.00

4548F **TYCOS BI-RECORDING THERMOMETER.** Same as Type 8070, except with chart as selected for any temperature range not exceeding 1000° Fahrenheit. Type 8072 ..... 183.60

4548G Instruments listed above will be furnished with Polished Nickel-Plated or Polished Bronze Case, if specified, at an extra cost of 18.00

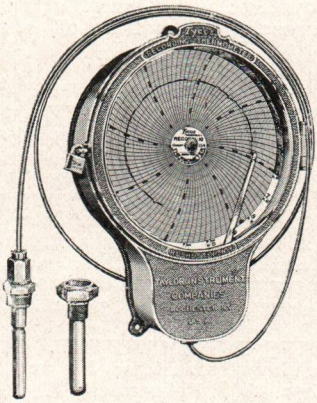
4548H Ditto for Moisture-Proof Case 11.00

Tycos RECORDING THERMOMETER

Dial Type

Bulb Stem With Separable Well Connection

Well Threaded for ¾-inch Pipe



No. 4549A

4549A The Separable Well Feature, as illustrated, has numerous advantages as a form of bulb stem connection and will be found best suited to conditions necessitating protection of bulb, against corrosion, or on apparatus under continuous operation, to avoid shutting down when disconnecting instrument. The well is machined from one piece, bored to accurate dimensions, to fit exactly corresponding machined-stem surfaces of bulb, which is seated by means of the swivel-nut of the union.

STANDARD LENGTH STEM WELLS

These are proportioned to cover certain temperature ranges within limits given in the table herewith. Measurements give length of bulb stem below thread.

LIST

For temperature ranges requiring a total of degrees on chart in excess of 250, the length of the bulb stem is 6½ inches or less and of uniform diameter; fitting snugly the straight bored well.

Tycos RECORDING THERMOMETER

DIAL TYPE

BULB STEM WITH SEPARABLE WELL CONNECTION

Well Threaded for ¾-inch Pipe

When ordering, state length of flexible connecting tubing, number of chart and full details of application. Separable Wells will be furnished with extension neck between wrench-head and thread to take care of insulation on pipe lines, if specified.

		Each
4550A	**TYCOS RECORDING THERMOMETER.** Nickel-plated cast-iron case with polished nickel-plated bronze front-ring. Bulb Stem with Separable Well Connection and 6 feet of flexible capillary connecting tubing. Chart as selected for any temperature range within limits of 40° below zero and +500° Fahrenheit. Complete with 100 charts, bottle of Tycos Recorder ink and lock with key. Type 8053.	$103.50
	For longer stem on well, add to list for each 6 inches or fraction over standard length	4.00
4550B	**TYCOS RECORDING THERMOMETER.** Same as Type 8053, except with chart as selected for any temperature range not exceeding 800° Fahrenheit. Type 8054	114.30
4550C	**TYCOS RECORDING THERMOMETER.** Same as Type 8053, except with chart as selected for any temperature range not exceeding 1000° Fahrenheit. Type 8055	128.70
4550D	**TYCOS BI-RECORDING THERMOMETER.** Nickel-plated cast-iron case with polished nickel-plated bronze front-ring. Bulb Stem with Separable Well Connection and 6 feet of flexible connecting tubing on each tube system, chart as selected for any temperature range within limits of 40° below zero and +500° Fahrenheit. Complete with 100 charts, 2 bottles of Tycos Recorder Ink and lock with key. Type 8093.	155.70
	For longer stem on either well, add to list for each 6 inches or fraction thereof over standard length	4.50
4550E	**TYCOS BI-RECORD RECORDING THERMOMETER.** Same as Type 8093, except with chart as selected for any temperature range not exceeding 800° Fahrenheit. Type 8094	171.90
4550F	**TYCOS BI-RECORD RECORDING THERMOMETER.** Same as Type 8093, except with chart as selected for any temperature range not exceeding 1000° Fahrenheit. Type 8095	193.50
4550G	Instruments listed above will be furnished with Polished Nickle-Plated or Polished Bronze Case, if specified, at an extra cost of	18.00
4550H	Ditto for Moisture-Proof Case	10.80

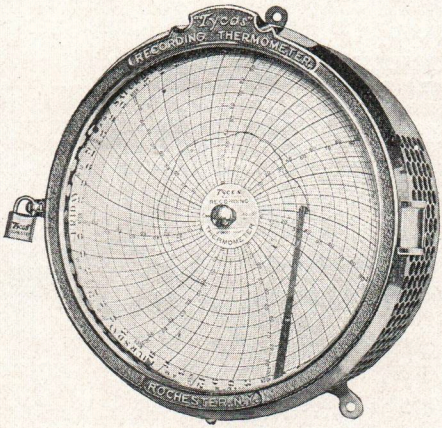
Tycos RECORDING THERMOMETER

Dial Type, Self-Contained Form

The Tycos is a superior instrument of handsome appearance, approximately 12 inches high, rugged and of practicable construction.

The body of the case is finished in weather-resisting instrument-black, while the solid-bronze hinged front is highly polished.

Specially adapted to recording atmospheric temperatures or to indoor use in Factories, Cold Storage Rooms, Offices, Hotels, Dwellings, etc.



No. 4551A

4551A *Tycos* **RECORDING THERMOMETER** (Self-Contained Form)
Each $54.00
With any temperature range chart listed below, complete with lock and key, 100 charts and bottle of Tycos Recorder ink. When ordering, state number of chart desired.

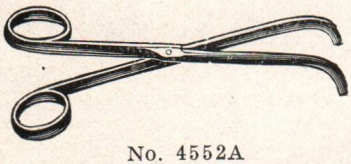
LIST OF CHARTS FOR TYPE 8000

	Chart Number	Temperature Range From—	To+	Degree Intervals	Period of Revolution	Temperature Scale
4551A	1501		10—120	2	24 Hours	Fahrenheit
4551B	1503		0—100	2	24 Hours	Fahrenheit
4551C	1504		0—120	2	24 Hours	Fahrenheit
4551D	1650	—25	+ 30	1	24 Hours	Reaumur
4551E	1662	(Reversed Scale)	0—100	2	24 Hours	Fahrenheit
4551F	1701		0—100	2	7 Days	Fahrenheit
4551G	1703		10—120	2	7 Days	Fahrenheit
4551H	1704		0—130	2	7 Days	Fahrenheit
4551I	1705		20—150	2	7 Days	Fahrenheit
4551J	1800	—20	+ 50	1	7 Days	Centigrade
4551K	1900	(Reversed Scale)	0—100	2	7 Days	Fahrenheit

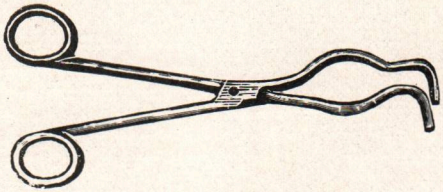
For conditions to which the Self-Contained Form *Tycos* Recorder is not adapted, such as chill rooms, smoke houses, drying rooms, ovens and other enclosed spaces, we recommend the Capillary Form *Tycos* Recorder, which permits of chart-case being placed outside the space, while the bulb-stem can be carried to any desired location.

If instruments desired are not listed above, write us for special bulletin.

TONGS

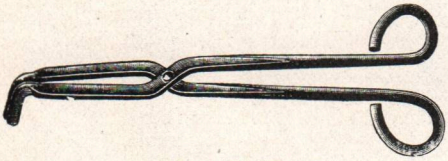


No. 4552A

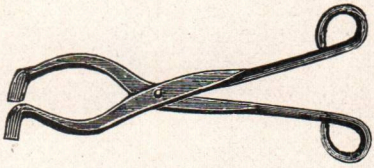


No. 4552B

4552A **TONGS, CRUCIBLE.** Forged Steel, single bent, N. P., 9 ins. long.$ .85
4552B **TONGS.** Same as above, but double bent..... 1.00
4552C **TONGS.** Same as above two tongs, with heavy platinum shoes, price according to weight of platinum, on application.
4552D **TONGS, CRUCIBLE.** Pure Nickel, double bent, 9 inches long.... 2.50
4552E **TONGS, CRUCIBLE.** Aluminum, double bent, 8 inches long..... 2.00

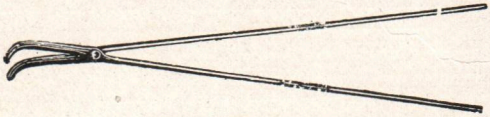


No. 4552F



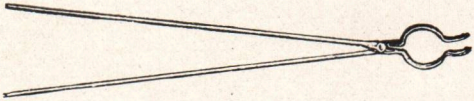
No. 4552G

4552F **TONGS, CRUCIBLE.** Rod iron, single bent, japanned, 9 inches long ..... .30
4552G **TONGS, CRUCIBLE.** Rod iron, double bent, japanned, 9 ins. long. .40
4552H **TONGS.** Same as above, 18 inches long..... 1.50



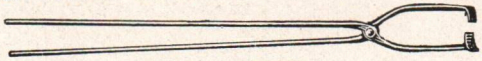
No. 4552I

4552I **TONGS, CRUCIBLE.** Steel, single bent, 30 and 36 inches long... 2.00



No. 4552J

4552J **TONGS, CRUCIBLE.** Steel, double bent, 30 and 36 inches long... 2.50



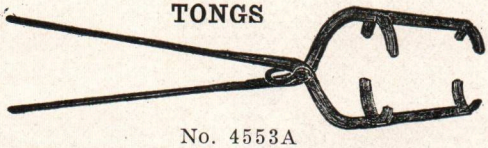
No. 4552K

4552K **TONGS, CRUCIBLE.** Steel, double bent, for lifting crucibles vertically, 36 inches long..... 3.50

No. 4552L

4552L **TONGS, CRUCIBLE.** Steel, crucible lifter, to take crucibles of any size up to 30 gram., 40 inches long..... 1.50

TONGS



No. 4553A

4553A **TONGS, CRUCIBLE.** Used when lifting black-lead or other heavy crucibles with a crane.

For crucibles No.	10 to 20	25 to 50	60 to 100	125 to 150
Each	$12.00	14.00	18.00	25.00

No. 4553B

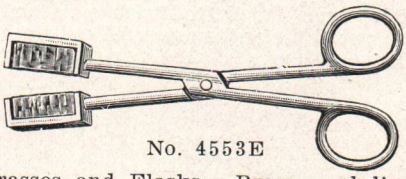
4553B **TONGS, CUPEL.** Steel, light, 30 and 36 inches long, each.....$1.00

No. 4553C

4553C **TONGS, CUPEL.** Steel, light, flat round ends, 30 and 36 inches long, each 1.00

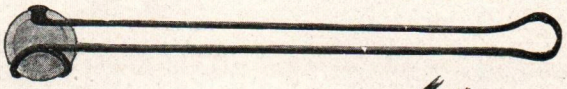
No. 4553D

4553D **TONGS, SCORIFIER and CRUCIBLE.** Steel, light, 30 and 36 inches long, each..... 1.50

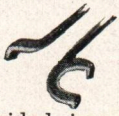


No. 4553E

4553E **TONGS,** for Matrasses and Flasks. Brass, cork-lined, 7 inches long, each 1.50



No. 4553F

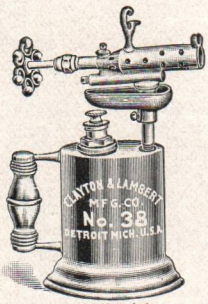


4553F **TONGS, SCORIFIER.** This is a decided improvement in tongs for scorifiers, roasting dishes, etc. It is made in such a manner that one pair of tongs will handle all sizes of scorifiers and roasting dishes from 1 to 6 inches. They are made in the same manner as an ordinary cupel tong, but differ from the old style scorifier tong in that they grasp the scorifier from above, holding it in such a manner that there is no danger of its slipping. As they are applied from above, it is possible to remove a scorifier or roasting dish from the back of the muffle without disturbing those in front of it. This also permits the ready change in position of either scorifiers or roasting dishes, and one side of the tip is shaped in such a manner that the contents of the vessel may be poured through it without releasing the grip of the tongs.

Each $1.50 1.75

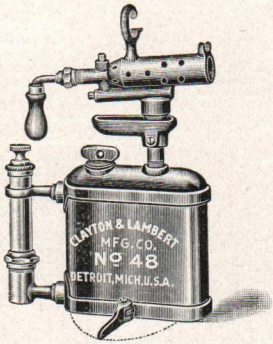
TONGS for Gas Pipes. See Pliers.

TORCHES



No. 4554A

No. 4554B

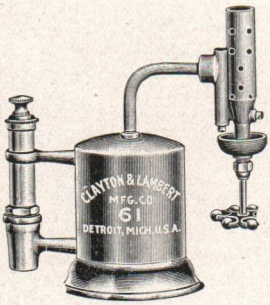


No. 4554C

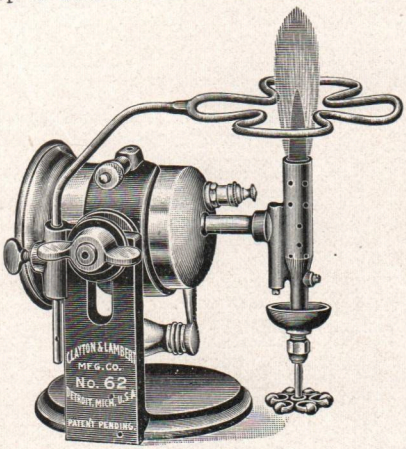
4554A **PINT SIZE.** Type 38. With hook and support on the burner tube. Produces a strong blue flame $13.25

4554B **QUART SIZE.** Type 32. Same as above, but with larger capacity, with hook and support on the burner tube 14.25

4554C **PINT SIZE.** Type 48. Fitted with a special burner, which is light, yet sufficiently powerful to generate a flame adapted to all requirements. The pump is automatic 17.25



4554D



No. 4554E

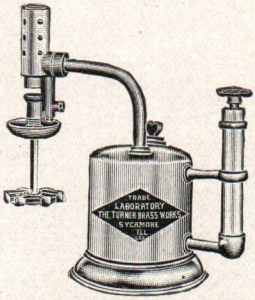
4554D **BURNER,** Gasoline. Type 61. The burner is rigid, produces an intensely hot blue flame, which can be regulated to a small pointed flame or a brush flame, capacity 1 pint. Each 9.00

4554E **BURNER,** Gasoline. Type 62. Adjustable laboratory form. Capacity one pint; flame can be turned at any angle. Tripod is also adjustable, which permits it being swung out of the way when not in use. Each, torch only 12.50
Stand only 8.00

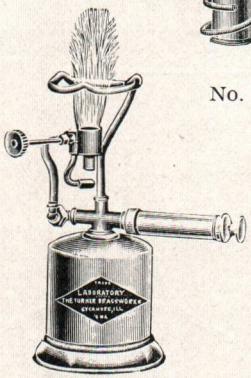
TORCHES

No. 4555B

Type 65
NICKEL PLATED BRASS
Capacity.....1 pint
Height over all.....9¾ inches
Diameter.....3⅜ inches
Net Weight.....1½ pounds
Ship. Wt.....2 pounds
Consumption.....About ½ pt. per hour
Price $10.00



No. 4555C

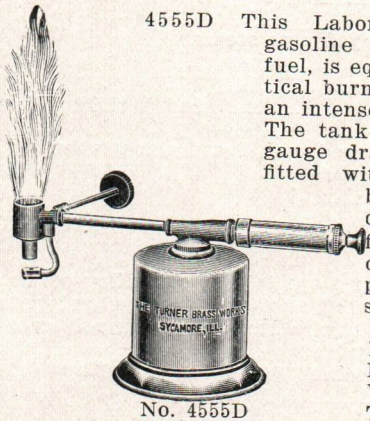


No. 4555A

4555A The Bunsen Burner generates a clear blue flame and is swiveled so that the flame can be raised or lowered or pointed in almost any direction. Used as a Bunsen Burner it is only necessary to point the flame upward. In that position with the tripod which is removable, metal can be melted, water heated and many other uses found for it in emergencies where other means of heating are not available. The burner is automatic in operation. Air pressure for operating is obtained by pump in handle. The flame is adjustable. Especially recommended for use of assayers.

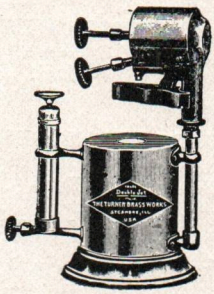
4555B **NICKEL PLATED POCKET TORCH** for alcohol; capacity ¼ pint; height 6½ inches; diameter 1¾ inches; weight 10 ounces. Type 58.....each $5.00

4555C **POLISHED BRASS LABORATORY TORCH,** capacity ½ pint; height 4 inches; diameter 3⅜ inches; weight ¾ pound. Type 64.....each $7.50



No. 4555D

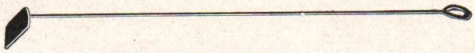
4555D This Laboratory Torch for gasoline holds one pint of fuel, is equipped with a vertical burner which produces an intensely hot blue flame. The tank is made of heavy gauge drawn brass and is fitted with our automatic brass pump to produce air pressure for operating. Recommended for experimental work in schools, offices, laboratories, etc. Height 7 inches. Diam., 3⅜ inches. Weight, 2 pounds. Type 51. Each..... 8.00



No. 4555E

4555E **THE TURNER DOUBLE TORCH** is supplied with a large, powerful burner, the size of flame being ¾ inch at the burner; polished brass; height 11¼ inches; diameter 4 inches; weight 4½ pounds. Type 97.....each $13.00

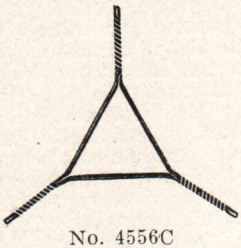
TRIANGLES



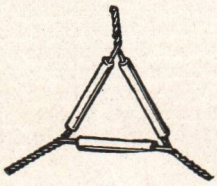
No. 4556A

4556A **CUPEL RAKE.** Iron, 24 in. long $1.00

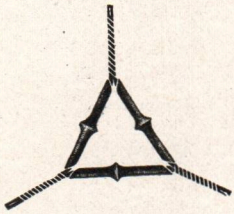
4556B **CUPEL SHOVEL.** Iron, 24 in. long 1.00



No. 4556C



No. 4556D



No. 5556E

4556C **TRIANGLES.** Iron, in three sizes, length of sides inside, 1½, 2 and 2½ in.
Dozen 75

4556D **TRIANGLES.** Iron, pipe stem covered.

Length of sides, inside ..... inches	2	2½	3	4
Each	$0.12	.13	.15	.20
Per dozen	$1.20	1.35	1.60	2.00

4556E **TRIANGLES.** Iron, covered with flanged pipe stems.

Length of sides inside ..... inches	2	2½	3½
Each	$0.15	.18	.20
Per dozen	$1.60	1.80	2.00

4556F **TRIANGLES.** On nichrome wire, covered with fused silica tubes.

Length of sides, inside ..... inches	1½	2	2½	3
Each	$0.30	.30	.45	.50

4556G **TRIANGLES.** All fused silica wire ..... $0.95 .95 1.15 1.25

4556H **TRIANGLES, CHROMEL.** Made from a special metallic alloy of very high melting point, remarkable resistance to oxidation and practically unaffected by ordinary action of acids; cost but one-sixteenth of platinum and last longer in service.

Length of sides, inside ..... inches	1½	2	2½	3
Each	$0.30	.35	.50	.60

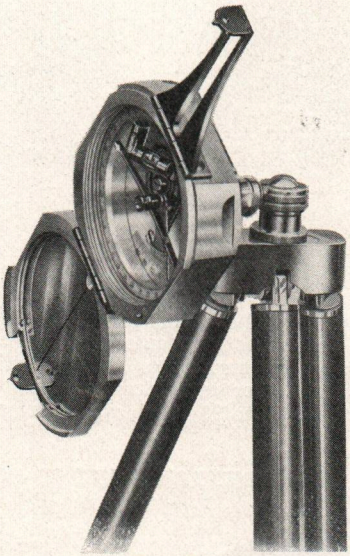
4556I **TRIANGLES.** Pure nickel wire.

Length of sides, inside ..... ctm.	4	6	8
Each	$0.75	1.00	1.25

TRIANGLES, PLATINUM AND TRIANGLE SUPPORTS. See Platinum.

POCKET TRANSITS

THE BRUNTON



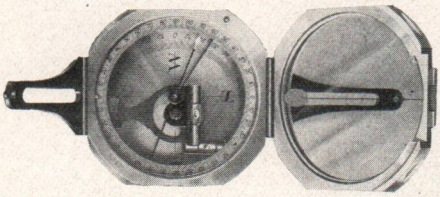
No. 4557A

USED ON THE TRIPOD FOR VERTICAL ANGLES

While the transit is designed to be used principally as a hand instrument, it is sometimes desirable to utilize the advantages of a fixed support and an attachment is furnished which permits the operator to use for this purpose the light telescoping camera tripod which most engineers include in their traveling equipment. The above illustration shows the instrument mounted on such a tripod and tilted over so that it may be used either as a level or for taking vertical angles.

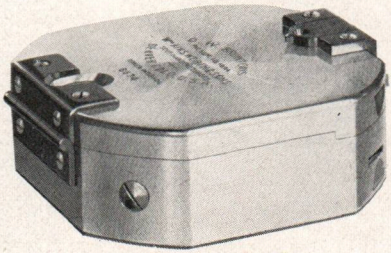
		Price
4557A	Improved Type with Sight on Cover, and Slots for Attachment to Tripod Head, Companss Circle Numbered from 0 to 360 Clockwise, complete	$37.50
4557B	Ball and Socket Tripod Head	5.50
4557C	Tubular Extension Tripod	7.00

THE BRUNTON PATENT POCKET TRANSITS



Operator's View

No. 4558A

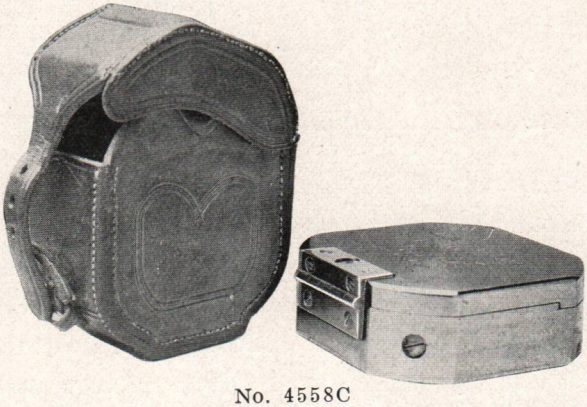


Folder for Pocket

No. 4558B

4558A It is used by over 10,000 civil and mining engineers, geologists and mine managers, who pronounce it the most convenient, compact and accurate instrument for preliminary surveying on the surface or underground. Price, standard type, without sight on cover or slots for attaching to tripod head and with compass circled numbered in quadrants (0 to 90) each way. Price.....$25.00

LEATHER CASES FOR BRUNTON PATENT POCKET TRANSITS

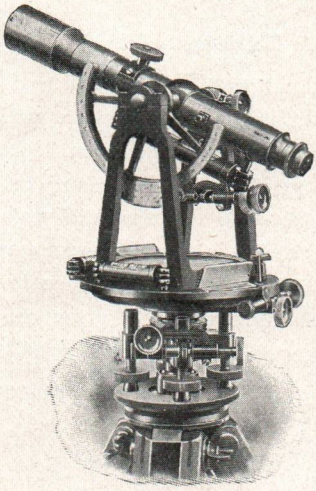


No. 4558C

			Price
4558C	No. 3622	Type A. Leather case as shown above for carrying in pocket	$1.75
4558D	No. 3624	Type B. Same as Type A, with looy for carrying on belt	2.00
4558E	No. 3626	Type C. Same as Type A, with sling strap	2.50
4558F	No. 3628	Type D. Leather case for carrying instrucent, tripod head, and tripod with sling strap	5.00

TRANSITS

AINSWORTH PRECISION TRANSITS



No. 4559A

TYPE CC TRANSIT

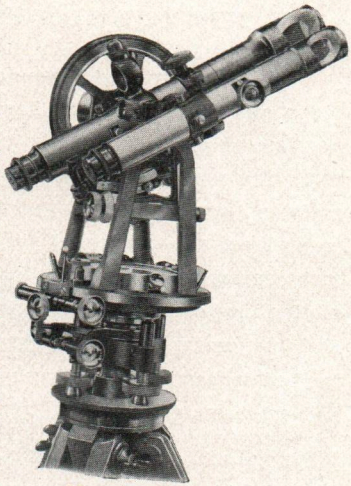
No. 4559A

4559A This style has 4½-inch limb with verniers at 30 degrees with telescope, 4½-inch vertical arc, 8-inch 20-power telescope, 4-inch 30 seconds telescope level, stadia, axis claim and tangent, 3-inch compass with magnetic variation plate actuated by pinion motion, all graduations excepting compass circle on solid silver. Non-cramping four-screw leveling head with shifting center Weight net, 6¼ lbs. In carrying case with the usual accessories and extension tripod. Price $285.00

TYPE CF MINING TRANSIT

4559B With Interchangeable Auxiliary Telescope and Counterweight, has 4½-inch limb with verniers at 30 degrees with telescope, 4½-inch vertical circle with aluminum guard, 8-inch 20-power main and auxiliary telescopes, 4-inch 30 seconds telescope level, stadia, axis clamp and tangent, 3-inch compass with magnetic variation plate actuated by pinion motion, all graduations excepting compass circle on solid silver. Non-cramping four-screw leveling head with shifting center. Net weight as shown, 7¾ lbs. In carrying case with the usual accessories and extension tripod.

Price, without reflectors or gradienter.....$366.00

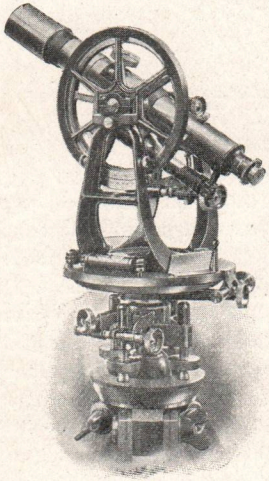


No. 4559B

Either of the foregoing instruments furnished in the 6, 5½, 5, and 4-inch limb sizes, and with any attachment which will be sent on application.

TRANSITS

AINSWORTH PRECISION THEODOLITES



No. 4560A

No. 4560A

TYPE BX THEODOLITE

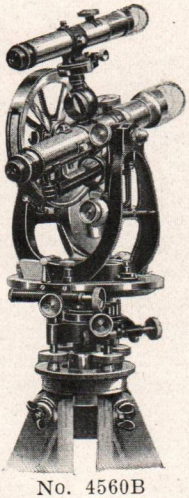
4560A Has 5-inch limb with verniers at 30 degrees with telescope, 5-inch vertical circle with aluminum guard, 10-inch 23-power telescope, 5-inch 30 seconds telescope level, stadia, axis clamp and tangent, U standard, 2½-inch compass with variation plate actuated by pinion motion, non-cramping four-screw leveling head with shifting center. Weight net, 10½ lbs. Packed in carrying case with the usual accessories and extension tripod.

Price $312.00

TYPE CZ MINING THEODOLITE

4560B **With Interchangeable Auxiliary Telescope and Counterweight,** has 4½-inch limb, with verniers at 30 degrees with telescope, 4½-inch vertical circle with aluminum guard, 8-inch 20-power main and auxiliary telescopes, 4-inch 30 seconds telescope level, axis clamp and tangent, U standard, 2½-inch compass with variation plate actuated by pinion motion, non-cramping four-screw leveling head with shifting center. Net weight as shown, 8¼ lbs. Packed in carrying case with the usual accessories and extension tripod.

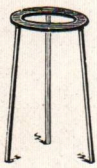
Price, without edge graduation and gradienter. $390.00



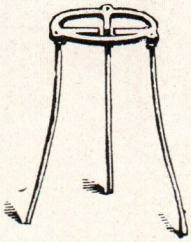
No. 4560B

Either of the foregoing instruments furnished in the 6, 5½, 5, 4½ and 4-inch limb sizes, and with any attachment as described in catalogue BX-40, which will be sent on application.

TRIPODS



No. 4561A



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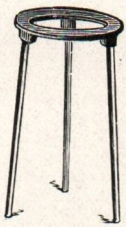
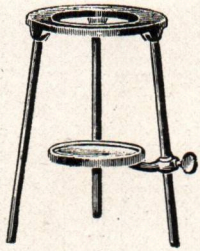


No. 4561C



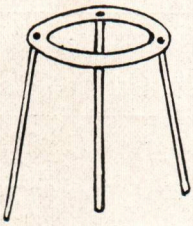
No. 4561D

4561A **TRIPOD.** Of japanned iron, light pattern, 6 inches high, inside diameter of ring, 2½ inches $0.25

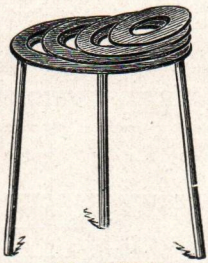
4561B **TRIPOD.** Japanned iron, 8 inches high, inside diameter of ring, 3½ inches, with three lugs ..... .40

4561C **TRIPOD.** Japanned iron, 8 inches high, inside diameter of ring, 3 inches ..... .40

4561D **TRIPOD.** Same as above but with adjustable lamp bracket ..... .75



No. 4561E



No. 4561F

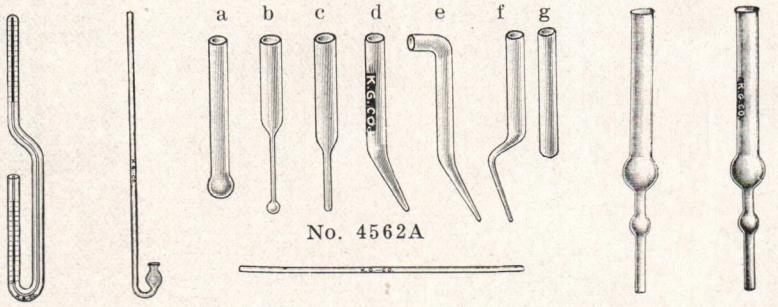
4561E **TRIPODS.** Japanned iron, 8 inches high:

Outside diam. of rings ..... inches	5	6	8
Price ..... each	$0.40	.55	.70

4561F **TRIPODS.** Japanned iron, 8 inches high:

Outside diam. of rings ..... inches	2	6	8	10	12
Number of rings	2	3	4	5	6
Price ..... each	$0.55	.70	.90	1.20	1.70

TUBES



No. 4562B No. 4562C No. 4562D No. 4562F No. 4562G

4562A **TUBES, ARSENIC.** Type 8655.

Style	A	B	C	D	E	F	G
Each	$0.04	.06	.05	.06	.06	.06	.04

4562B **TUBES, BAROMETER, BUNSEN'S.** Graduated in millimeters; tube only. Type 8660. Each $4.50

4562C **TUBES, BAROMETER.** Bent, with bulb closed at one end. Type 8665. Each 1.00

4562D **TUBES, BAROMETER.** Straight, closed at end. Type 8670. Each ..... .75

4562E **TUBES, CALCIUM CHLORIDE.** With one bulb. Type 8673.

Length, ... inches	3	4	5	6	8	10
Each	$0.09	.10	.12	.13	.16	.21

4562F **TUBES, CALCIUM CHLORIDE.** With two bulbs. Type 8680.

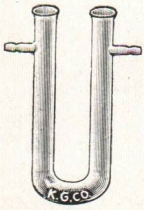
Length ..... inches	3	4	5	6	8	10
Each	$0.10	.11	.13	.15	.18	.24

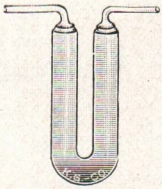
4562G **TUBES, CALCIUM CHLORIDE.** With two bulbs, with small inner tube to collect moisture in the first bulb. Type 8685.

Length ..... inches	3	4	5	6	8	10
Each	$0.18	.20	.24	.26	.33	.40

TUBES

No. 4563A


No. 4563B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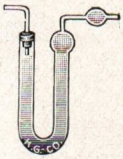
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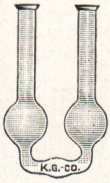
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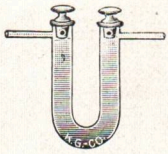
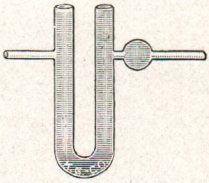

No. 4563F


No. 4563G

4563A **TUBES, CALCIUM CHLORIDE.** "U" shape. Type 8690.

Length ....inches	3	4	5	6	7	8	10
Each	$0.18	.20	.25	.30	.36	.50	.65

4563B **TUBES, CALCIUM CHLORIDE.** "U" shaped with side tubes. Type 8695.

Length ....inches	4	5	6	8
Each	$0.22	.29	.36	.57

4563C **TUBES, CALCIUM CHLORIDE.** With ground in outlet tubes. Type 8700.

Length ....inches	4	5	6
Each	$0.90	1.00	1.20

4563D **TUBES, CALCIUM CHLORIDE, MARCHAND'S.** Type 8705.

Length ....inches	4	5	6
Each	$0.30	.40	.50

4563E **TUBES, CALCIUM CHLORIDE, PELIGOT'S.** With three bulbs. Type 8710.

Length ....inches	4	5	6	7	8
Each	$0.40	.50	.65	.80	1.00

4563F **TUBES, CALCIUM CHLORIDE, SCHWARZ'S.** Type 8715.

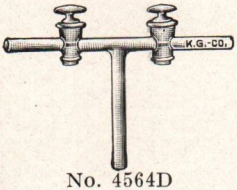
Length ....inches	4	5	6	7	8
Each	$1.30	1.40	1.60	2.00	2.50

4563G **TUBES, CALCIUM CHLORIDE, VOLHARD'S.** With two side tubes and bulg. Type 8720.

Length ....inches	5	6	8
Each	$0.45	.50	.75

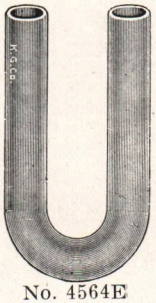
TUBES

No. 4564A



No. 4564D

No. 4564G



No. 4564E

No. 4564H

4564A **TUBES, CONNECTING.** Both ends same size. Type 8760.

Diameter ..... inches	¼	⅜	½
Length ..... inches	2½	2¾	3
Each	$0.05	.05	.05

4564B **TUBES, CONNECTING.** Ends different sizes. Type 8765.

Diameter ..... inches	¼	⅜	½
Length ..... inches	2½	2¾	3
Each	$0.05	.05	.05

4564C **TUBES, CONNECTING.** "T" shaped. Type 8770.

Diameter ..... inches	⅛	3/16	¼	5/16	⅜	½	¾
Each	$0.08	.09	.10	.11	.12	.17	.45

4564D **TUBES, CONNECTING.** "T" shaped, with two Geissler stopcocks. Bore, 5 m/m. Type 8775. ..... each 3.00

4564E **TUBES, CONNECTING.** "U" shaped. Type 8780.

Diameter ..... inches	¼	⅜	½	¾
Each	$0.10	.12	.17	.45

4564F **TUBES, CONNECTING.** "Y" shaped. Type 8785.

Diameter ..... inches	⅛	3/16	¼	5/16	⅜	½	¾
Each	$0.08	.09	.10	.11	.12	.17	.45

4564G **TUBES, CULTURE, GAYON'S.** 225 m/m. long by 20 m/m. diameter. Type G790. ..... each .46

4564H **TUBES, CULTURE, ROUX.** for potato culture. 155 m/m. long by 20 m/m. diameter. Type 8795. ..... each .18

TUBES

No. 4565A

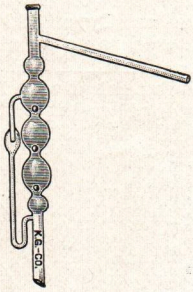
No. 4565B

No. 4565C

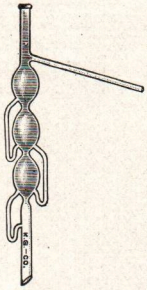
4565A **TUBES.** Distilling. Plain form for fractional distillation. Type 8800. Each $0.25

4565B **TUBES. Distilling.** With one bulb. Type 8805. Each ..... .40

4565C **TUBES.** Distilling. With two bulbs. Type 8810. Each ..... .50



No. 4565D



No. 4565F

4565D **TUBES.** Distilling. Glinsky's. With glass valves. Length, 8 inches. Type 8815. Each 2.25

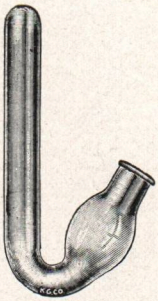
4565E **TUBES.** Distilling. Lebel and Henninger's. With two bulbs. Type 8820. Each 1.50

4565F **TUBES.** Distilling. Lebel and Henninger's. With three bulbs. Type 8825. Each 1.65

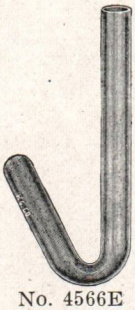
4565G **TUBES.** Distilling. Lebel and Henninger's. With four bulbs. Type 8830. Each 2.80

4565H **TUBES.** Distilling. Lebel and Henninger's. With five bulbs. Type 8835. Each 3.80

TUBES


No. 4566A

No. 4566B


No. 4566E

4566A **TUBES.** Fermentation. Ungraduated, without foot. Type 8840.

Diameter, inches	½	⅝	11/16
Length, inches	½	⅝	11/16
Each	$0.15	.25	.30

4566B **TUBES.** Fermentation. Ungraduated, on foot. Type 8845.

Diameter, inches	½	⅝	11/16
Length, inches	5¾	6¾	7¾
Each	$0.30	.35	.40

4566C **TUBES.** Fermentation. Same style as Type 8840. American Public Health Association Standard (See Standard Method for the Examination of Water and Sewage). Inside diameter of upright tube, 15 m/m; length of vertical tube, 140 m/m; diameter of bulb, 38 m/m; without foot. Type 8850. Each $0.50

4566D **TUBES.** Fermentation. Same style as Type 8850. American Public Health Association Standard; same as above but with glass foot. Type 8855. Each ..... .75

4566E **TUBES.** Fermentation. Without bulb, fish hook form. Height of vertical tube, 100 m/m; outside diameter of tube, 12 to 13 m/m. Type 8860. Each ..... .15

No. 4566G

No. 4566H

No. 4566I

No. 4566J

4566F **TUBES.** Filter. For filtering through asbestos, glass wool or glass powder. Type 8865.

Length, inches	6	8
Each	$0.20	.30

4566G **TUBES.** Filter. Fresenius. With bulb, 20 m/m. inside diameter of top. Type 8870. Each $0.30

4566H **TUBES.** Filter. With stems ground to a point for use with Gooch's Crucibles. Type 8875.

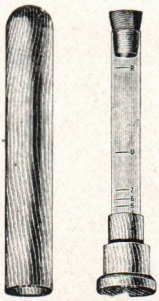
4566I **TUBES.** Phosphorous. Goetz. Graduated and with glass stopper. Type 8890. Each 1.50

4566J **TUBES.** Phosphorous. Goetz. Ungraduated and without glass stopper. Type 8895. Each ..... .60

URINE ANALYSIS APPARATUS

No. 4567A

No. 4567B



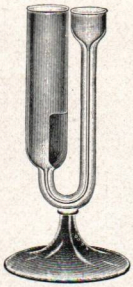
No. 4567C

4567A **ALBUMINOMETERS.** Eschbach's. Without foot, for the quantitative estimation of Albumen in urine. Type 8975 ..... $ .30

4567B **ALBUMINOMETERS.** Eschbach's. Same as Type 8975, on foot. Type 8980. Each ..... .45

4567C **ALBUMINOMETERS.** Eschbach's. In wood case, and with rubber stopper. Type 8985. Each ..... .50

No. 4567D

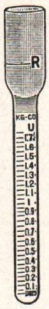


No. 4567E

4567D **ALBUMINOMETERS.** Glass, on foot, with pointed bottom, for reading small quantities. Type 8980. Each 1.20

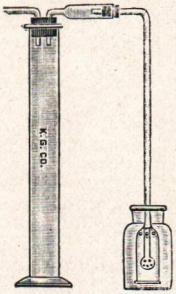
4567E **ALBUMOSCOPES.** So-called Horismascopes. For the detection of Albumen in urine with nitric acid. Very sensitive and rapid. Type 8995. Each 1.20

URINE ANALYSIS APPARATUS



No. 4568A

No. 4568B



No. 4568C

4568A **ALBUMINOMETERS.** For the rapid quantitative determination of Albumen in urine by the use of the tube and a centrifuge. Type 9000. Each $1.75

4568B **ALBUMINOMETERS, ESCHBACH'S, SCHELENZ.** With constriction near base for more accurate reading in small quantities; in wooden case. Type 9005. Each 1.25

4568C **AMMONIA APPARATUS, FOLIN'S.** Complete, consisting of special Ammonia Absorption tube, cylinder, drying tube and bottle with rubber stopper. Type 9010. Each 3.50

No. 4568D

No. 4568E

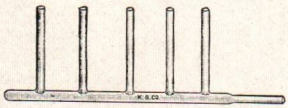
No. 4568F

4568D **AMMONIA TUBES, FOLIN'S.** For the absorption of ammonia in urine analysis. Type 9015. Each 1.40

4568E **AMMONIA ABSORPTION TUBES.** Used with Folin's Apparatus. Type 9020. Each ..... .28

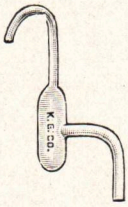
4568F **CONDENSER TUBES.** For urea, 250 m/m. by 15 m/m. Type 9025. Each ..... .20

URINE ANALYSIS APPARATUS



No. 4569A

No. 4569B



No. 4569C

4569A **CONNECTING TUBES.** For use with Absorption Tubes. Type 9030.

Number of arms	4	5	6
Each	$1.20	1.40	1.60

4569B **FUME ABSORPTION TUBES.** Furnished straight, for bending at desired angle in the laboratory. Type 9035. Each.....$0.70

4569C **GLASS TRAP FOR AMMONIA.** Used in connection with Folin's new method of total nitrogen urea and ammonia in urine. Type 9040. Each..... .70

No. 4569D

No. 4569E

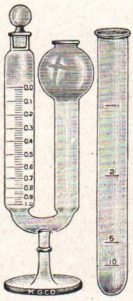
No. 4569F

4569D **REACTION GLASS, RANKE.** For Ehrlich's Diazo Reaction. Type 9045. Each..... .85

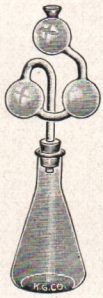
4569E **SACCHAROMETERS, EINHORN'S** Fermentation. For the determination of sugar in urine, consisting of a graduated fermentation tube and a graduated test tube. Percentage of sugar present is read directly on the tube. Type 9050. Each ..... .60

4569F **SACCHAROMETER, EINHORN'S** Improved Fermentation; fitted with glass stopcock for easy filling, with graduated test tube. Type 9055. Each..... 3.00

URINE ANALYSIS APPARATUS



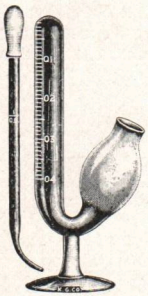
No. 4570A



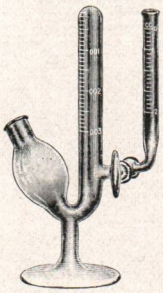
No. 4570B

4570A **SACCHAROMETERS, LOWENSTEIN'S.** For the accurate determination of sugar in diluted urine. Type 9060. Each.....$3.25

4570B **UREA APPARATUS, FOLIN'S.** Complete, consisting of special urea bulb, flask and rubber stopper. Type 9065. Each..... 1.80



No. 4570C



No. 4570E

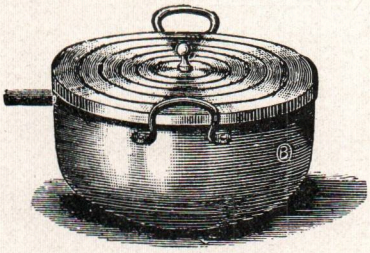
4570C **UREOMETERS, DOREMUS.** With foot, for determination of amount of urine by hydrobromate method. Consists of a graduated fermentation tube and graduated pipette for introducing the hydrobromate solution; graduations read to 1/10 per cent; complete with directions. Type 9070. Each .95

4570D **UREOMETERS, DOREMUS.** Same as Type 9070, without foot. Type 9075. Each ..... .80

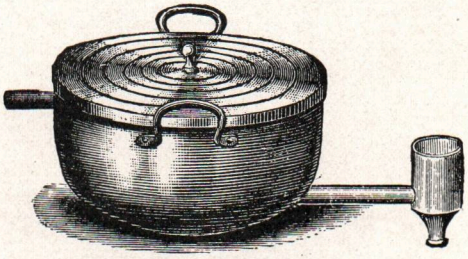
4570E **UREOMETERS, DOREMUS HINDS.** Improved form, with foot, having a graduated side tube with glass stopcock, from which the exact amount of urine may be introduced into the fermentation tube without any gas escaping from the bulb. Type 9080. Each..... 4.50

4570F **UREOMETERS, DOREMUS HINDS.** Same as Type 9080, without foot. Type 9085. Each..... 4.00

WATER BATHS



No. 4571A



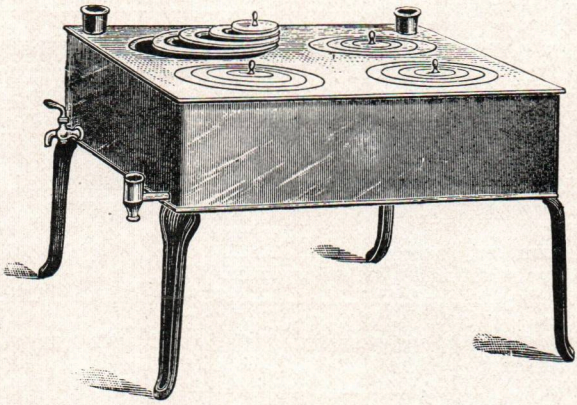
No. 4571B

4571A **WATER BATH,** heavy copper, tin-lined, with concentric rings and cover, handles and steam escape.

Diameter ....inches	4	5	6	8	10
Price ....each	$1.50	1.75	2.50	3.75	7.50

4571B **WATER BATH,** heavy copper, tin-lined, with Kekule's constant water level.

Diameter ....inches	5	6	8	10
Price ....each	$2.90	3.50	4.80	7.80

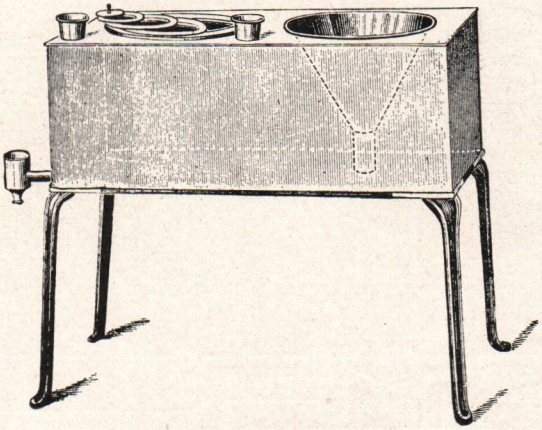


No. 4571C

4571C **WATER BATH,** heavy copper, with three 6-inch and four 4-inch openings. All provided with concentric rings and cover in center; with stop-cock and constant water regulator.
Size, 23x14x15 inches....each $25.50

4571D **WATER BATH,** same as above, but fitted with a coil, to be heated by steam ....each 36.00

WATER BATHS



No. 4572C

4572A **WATER BATH,** of copper, with four 5-inch holes; size 14x14x5 inches $20.00

4572B **WATER BATH,** same as above, but fitted with a coil, to be heated by steam, each 25.00

4572C **WATER BATH,** of copper, according to Griffin, for hot filtration and evaporation, size, 13x7x5 inches, tin-lined, with copper funnel, and one 5-inch hole with four concentric rings and cover. It is provided with a constant water level, an extra sheet iron bottom, and rests on four detachable legs 15.00

4572D **WATER BATHS,** of polished heavy copper, tin lined, with handles, steam escape, and concentric copper rings with cover; hemispherical.

Diameter, inches	4	5	6	8	10
Number of rings, including cover.	3	4	5	6	7
Each	$1.50	1.80	2.10	4.00	5.10

4572E **WATER BATHS,** same as No. 5866, fitted with constant water level.

Diameter, inches	5	6	8	10
Each	$2.50	3.00	4.90	6.75

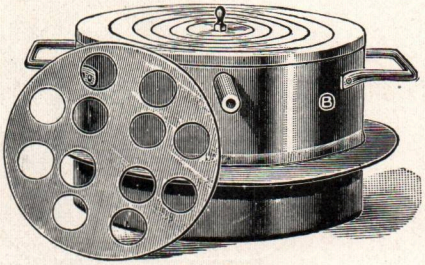
4572F **WATER BATH, BLAIR'S.** With test tube rack; for iron analysis. Made of polished copper. Diameter, 7 inches $5.25

4572G **WATER BATHS.** Funnel form, with constant water level and tripod.

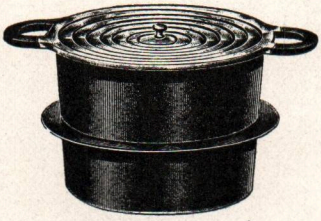
Diameter, inches	6	8
Each	$5.50	7.00

4572H **WATER BATH.** Rectangular, of heavy copper, tin-lined, 7½x 7½x6½ inches high, with galvanized iron tray to hold 25 test tubes 8x⅞ inch $9.00

WATER BATHS



No. 4573A



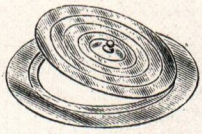
No. 4573B

4573A **WATER BATH.** Of polished copper, tin-lined. The body of this bath is made of one piece (seamless), with concentric rings and cover, steam escape and extra plate perforated for test tubes.

Diameter, ...inches	5	6	8
Rings ....inches	4	5	6
Each	$4.50	5.00	8.00

4573B **WATER BATH.** Cylindrical, of iron, porcelain-lined inside, with set of copper rings and cover.

Diameter, ...inches	5	6	8
Each	$4.00	4.50	5.50



No. 4573C

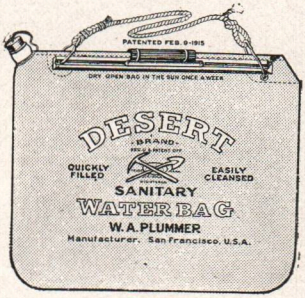
4573C **RINGS, CONCENTRIC.** Of copper, tinned inside, for water baths, etc.

Number in set....	3	4	5	5	7	8	9
O.D. of largest....inches	4	5	5½	6	8	10	12
Per set	$1.00	1.20	1.30	1.50	2.50	4.20	8.00

4573D **RINGS, CONCENTRIC.** Of porcelain, with cover.

Number in set....	5	6	7
O.D. of largest....inches	16	20½	25 C.M.
Per set	$1.65	2.20	2.70

WATER BAGS



No. 4574A

No. 4574B

SANITARY OR OPEN TOP STYLE

No.	Size			
4574A	1 Gal. Sanitary	11½x10	each	$1.50
4574B	2 " "	15½x12¾	each	2.00
4574C	3½ " "	14 x21½	each	3.00
4574D	5 " "	17 x23½	each	3.80

SANITARY STYLE WITH "DESERT" FAUCET FEATURE

4574E	3½ Gal. Sanitary with Faucet	14 x21½	each	$3.60
4574F	5 " " " "	17 x23	each	4.50

CLOSED TOP STYLE

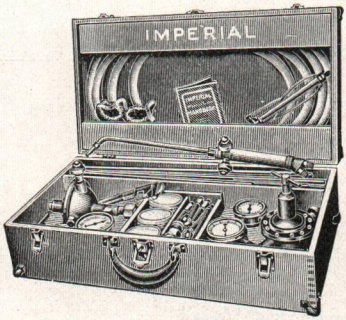
4574G	1 Gal. Regular	10 x11½	each	$1.40
4574H	2 " "	12¾x15½	each	1.85
4574I	3½ " "	14 x21½	each	2.75
4574J	5 " "	17 x23½	each	3.50
4574K	3½ Gal. Regular with Faucet	14 x21½	each	3.35
4574L	5 " " " "	17 x23½	each	4.25
4574M	6 " Filter Cooler, Lid Top	Di.10 x23	each	5.00
4574N	½ " (See Illustration)	11 x 7	each	1.00
4574O	2 " Wide Style	15½x12¾	each	1.85

NOTE—Last dimension denotes depth of bags. Wide Stwle, Closed Top made in 2 gal. size only.

4574P "DESERT" Water Bag Supporters for Automobiles, each $1.25

Supporters (Automobile Accessory) Plus 5% Government Tax.

WELDING APPARATUS



No. 4575A

Imperial Equipment is thoroughly practical, economical and safe. It is furnished in four outfits as listed below to meet the various requirements of service. No other torch has a mixing principle like the IMPERIAL—scientific, practical, years ahead. IMPERIAL TORCHES are approved by the Underwriters' Laboratories of the National Board of Fire Underwriters. No other regulator so accurately and uniformly controls delivery of gases—none has its automatic safety features.

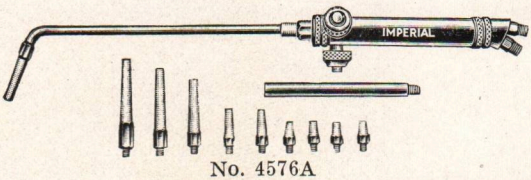
4575A **IMPERIAL WELDING AND CARBON BURNING OUTFIT.** Type 1. For all general welding work, from thin sheet metal to heaviest castings. Consists of Type B Imperial Welding Torch with 10 welding tips, extension, carbon burning torch, regulators, 4 gauges, hose, connections, goggles, hand-book, carrying case, complete supply of welding materials, ready for service.
Each ..... $ 75.00

4575B **IMPERIAL CUTTINB OUTFIT.** Type 3. For light and heavy cutting of steel and wrought iron. Consists of Type E Imperial Cutting Torch with 2 housings and 4 tips, regulators, 4 gauges, hose, connections, goggles, hand-book, carrying case, etc., complete, ready for service.
Each ..... $ 95.00

4575C **IMPERIAL COMBINATION WELDING, CUTTING AND CARBON BURNING OUTFIT.** Type 4. A splendid equipment for all general work, garages, etc. Combination welding and cutting torch performs both operations. Consists of Type B Imperial Welding Torch with Cutting Attachment, 10 welding and 3 cutting tips, carbon burning torch, regulators, 4 gauges, hose, connections, goggles, hand-book, carrying case, complete supply of welding materials, ready for service.
Each 90.00

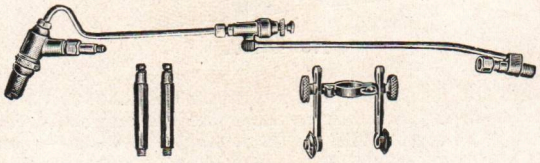
4575D **IMPERIAL DUPLEX WELDING, CUTTING AND CARBON BURNING OUTFIT.** Type 5. Best all purpose apparatus obtainable at any price. Fully adequate to handle all welding and cutting for which the process is adapted. Consists of a complete No. 1 Imperial Welding Outfit as described above and also includes a Type E Imperial Cutting Torch with 2 housings and 4 tips and an extra pair of goggles and 25-ft. lengths of hose.
Each 120.00

WELDING APPARATUS



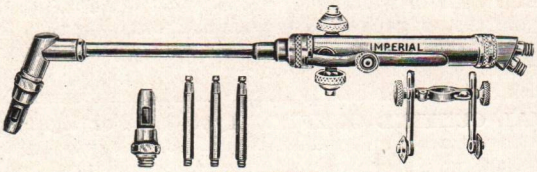
No. 4576A

4576A Type B Imperial Welding Torch, as furnished with Imperial Outfits Types 1, 4 and 5 ..... $25.00



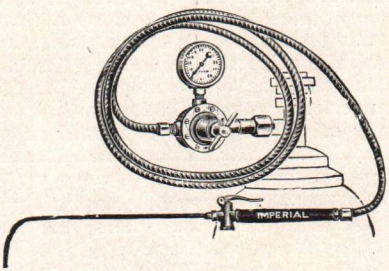
No. 4576B

4576B Imperial Cutting Attachment, for use with Type B Welding Torch. Makes it possible to weld or cut with one torch, as furnished with Imperial Outfit Type 4 ..... $20.00



No. 4576C

4576C Type E Imperial Cutting Torch, as furnished with Imperial Outfits Types 3 and 5 ..... $45.00

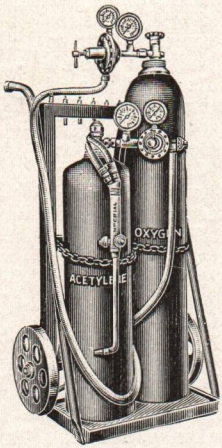


No. 4576D

Type 6 Imperial Oxygen Decarbonizing Outfit

4576D Outfit consists of Type G Carbon Burning Torch, Type D Regulator, gauge, hose, connections, etc. Each $15.00

WELDING APPARATUS

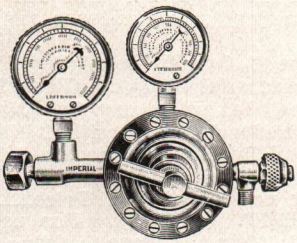


No. 4577A

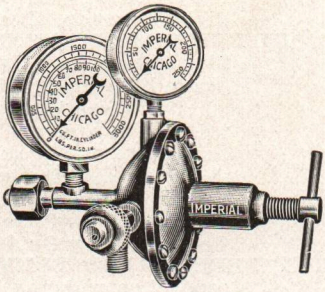
IMPERIAL TRUCK

Is a great convenience when outfit is to be frequently moved around shop or yards.

4577A For two one hundred-foot tanks. Type 51-H.....$12.00
4577B For one two hundred and one three hundred-foot tank. Type 52-H..... 15.00



No. 4577C



No. 4577D

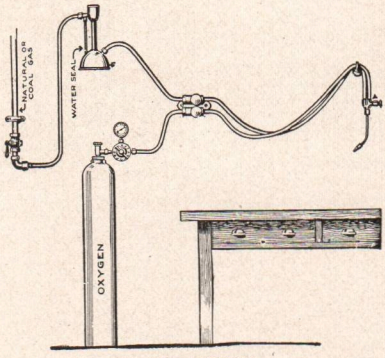
4577C Type C Imperial Oxygen Regulator, as furnished with Imperial Welding and Cutting Outfits Types 1, 3, 4 and 5.....$25.00

4577D Type AA Imperial Acetylene Regulator, as furnished with Imperial Welding and Cutting Outfits Types 1, 3, 4 and 5.....$22.00

We carry a full line of all welding supplies.

WELDING APPARATUS

4578A **IMPERIAL LEAD BURNING OUTFIT.** Type 20. For use with dissolved acetylene gas and oxygen in high pressure tanks. (Large or small size acetylene tanks may be used.) Outfit consists of: 1 Type F Oxygen Regulating Valve with 15-lb. pressure gauge, 1 Type 10R Acetylene Constant Pressure Regulator, 35 feet $\frac{3}{16}$ in. special rubber hose, 1 Bench Block with 2 needle valves, 1 Type L Imperial Lead Burning Torch with 4 tips, 1 Wrench. Outfit packed in individual carton. This outfit can also be used for light welding on all metals. Lead Burning Outfit (Tanks not included). Price..$25.00



No. 4578D

4578B **IMPERIAL LEAD BURNING OUTFIT.** Type 21. For use with hydrogen and oxygen in high pressure cylinders.

Outfit consists of: 1 Type F Oxygen Regulating Valve with 15 lb. Pressure Gauge, 1 Type FH Hydrogen Regulator with 15 lb. Pressure Gauge, 35 feet $\frac{3}{16}$ in Special Rubber Hose, 1 Bench Block with 2 Needle Valves, 1 Type L Lead Burning Torch with 4 Tips, 1 Wrench. Outfit packed in individual carton. This outfit can also be used for light welding on all metals. Lead Burning Outfit (Tanks not included). Price.. 30.00

4578C **IMPERIAL LEAD BURNING OUTFIT.** Type 22. For use with hydrogen gas in high pressure tank and compressed air.

Outfit consists of: 1 Type FH Hydrogen Regulating Valve with 15 lb. Pressure Gauge, 1 Type 10R Constant Air Pressure Regulator, 35 feet $\frac{3}{16}$ in. Special Rubber Hose, 1 Bench Block with 2 Needle Valves, 1 Type L Imperial Lead Burning Torch with 4 Tips, 1 Wrench. Outfit packed in individual carton. Lead Burning Outfit (Tank not included).... 25.00

4578D **IMPERIAL LEAD BURNING OUTFIT.** Type 24. For use with illuminating gas (Hydro-carbon gas) or natural gas and oxy gen in high pressure tanks.

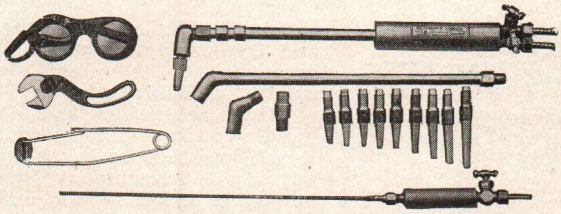
Outfit consists of: 1 Type F Oxygen Regulating Valve with 15 lb. Pressure Gauge, 1 Imperial Hydraulic Back Pressure Valve and Purifier for Coal Gas or Natural Gas, 35 feet $\frac{3}{16}$ in. Special Rubber Hose, 1 Bench Block with 2 Needle Valves, 1 Type L Imperial Lead Burning Torch with 4 Tips, 1 Wrench. Outfit packed in individual carton.
Lead Burning Outfit. (Tank not included.) Price..... 25.00

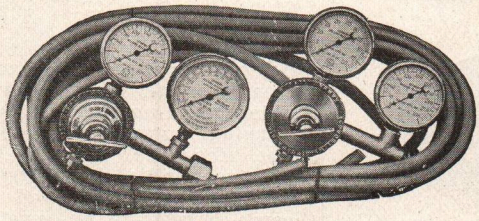
4578E **IMPERIAL LEAD BURNING OUTFIT.** Type 26. For use in connection with regular Imperial Oxy-Acetylene Welding Outfits. Outfits consists of: 1 Type L Imperial Lead Burning Torch with 4 Tips, 1 Bench Block with 2 Needle Valves, 16 feet Special $\frac{3}{16}$ in. Rubber Hose, 1 Wrench Outfit packed in individual carton. Lead Burning Outfit. Price..... 9.00

4578F **IMPERIAL LEAD BURNING OUTFIT.** Type 27. For use with illuminating (city) gas and compressed air. Outfit consists of: 1 Type O Imperial Lead Burning Torch with 1 Tip, 1 Type O Bench Block, 17 feet of Hose, 1 Gas Shut-off Cock, and 1 Air Shut-off Cock. Outfit packed in individual carton
Lead Burning Outfit. Price.....$12.00

THE ECONOMY

TYPE K WELDING AND CARBON BURNING OUTFIT





No. 4579A

An outfit which enables the user to handle all welding work within range of the oxy-acetylene process; no job too large, none too small. Designed for the user who wants the best, most complete and most dependable "all purpose welding and carbon burning outfit" procurable, for use with either compressed acetylene and oxygen from cylinders or acetylene generators. When ordering specify make and size of cylinders to be used so correct fitting for regulators (adapter) may be supplied, or, if generator is to be used, so correct type of regulator may be furnished.

4579A **STYLE K WELDING AND CARBON BURNING OUTFIT.** Type 1—(complete as illustrated above and specified below).....$100.00

4579B **STYLE K WELDING OUTFIT.** Type 2. Same as Type 1 except WITHOUT Carbon-Burning Torch..... 97.50
Oak carrying Case for either Type 1 or Type 2 Outfits. EXTA 8.00

COMPLETE SPECIFICATIONS AND PRICES OF PRINCIPAL PARTS

4579C **ONE STYLE K WELDING TORCH,** with 10 different size nickel-copper welding tips, 45° or 90° Welding Head with Union Nut (SPECIFY DEGREES WANTED), 180° Welding Head for "straight-ahead" or "overhead" welding and 15-inch Extension for use on HEAVY work.....$40.00

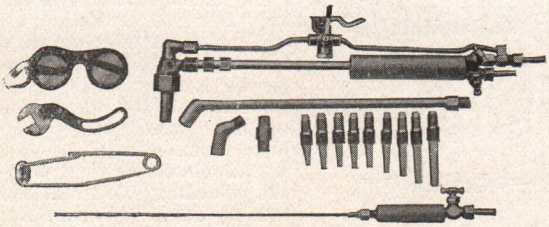
4579D **ONE No. 9 OXYGEN REGULATOR** (2⅝-inch diaphram) with 3-inch "working pressure" gauge, graduated: 0 to 500 lbs; 3½-inch "tank pressure" gauge, graduated: 0 to 3000 lbs., (also shows tank contents in cubic feet). Fitting is for Linde and other standard oxygen cylinder valves..... 30.00

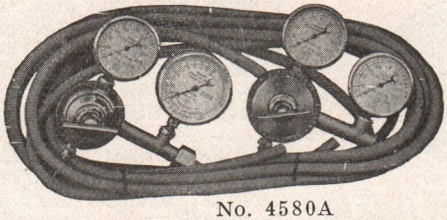
4579E **ONE No. 15 ACETYLENE REGULATOR** (3-inch diaphragm) with 3-inch "working pressure" gauge, graduated: 0 to 50 lbs.; and 3-inch "tank pressure" gauge, graduated: 0 to 500 lbs. (Fitting is for Prest-O-Lite automobile or lighting size cylinders; SPECIFY make and size of cylinders to be used so correct fitting (adapter) may be supplied)..... 18.00

4579F **ONE 15-FT. LENGTH ¼-INCH OXYGEN WELDING HOSE,** 15-foot length ¼-inch Acetylene Welding Hose, 4 Hose Clamps, "Fyber-Weld" Goggles, Torch Wrench, Torch Lighter and Instruction Book on Care of Apparatus, Welding, Cuttng and Carbon-Burning. Price F. O. B. Factory.

THE ECONOMY

STYLE K WELDING, CUTTING AND CARBON-BURNING OUTFIT





No. 4580A

Same as Style K Welding and Carbon Burning Outfit, except that the removable cutting attachment with 3 cutting tips enables user to handle cutting work as well as all welding and carbon burning. Attachment can be put on or removed in less than a minute; extra cost is more than paid for by a single "cutting job."

Designed for those who not only want the best, most complete and most dependable "welding and carbon burning outfit" procurable, but who also want to be able to handle the "cutting work" which is bound to come from very unexpected sources. The "cutting attachment" enables user to bevel wrought iron or steel shafts and castings instead of wasting time and money required in "grinding" when preparing for welding.

It is not designed for those who will have a considerable amount of cutting work. Either the Type 3 or 4 outfits are recommended for the Style G Cutting Torch, as furnished with these particular outfits, is designed for cutting work exclusively. Greater efficiency in all cutting work is insured and the separate welding and cutting torches eliminate the inconvenience experienced in putting on or removing "cutting attachment."

4580A **STYLE K WELDING, CUTTING AND CARBON BURNING OUTFIT,** complete as illustrated. Type 1 ..... $115.00

4580B **STYLE K WELDING AND CUTTING OUTFIT.** Same as Type 1 except without carbon burning torch. Type 2 ..... 112.50

Specifications and prices of principal parts are same as Style K Welding and Carbon Burning Outfit, with exception of:

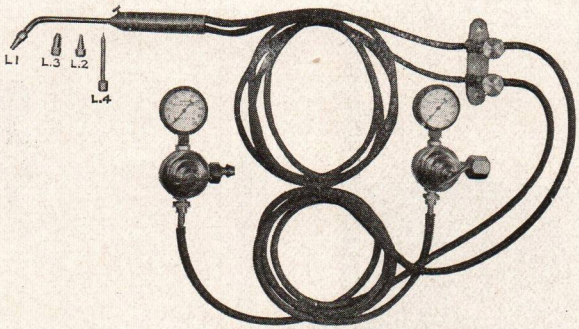
4580C **ONE STYLE K COMBINATION WELDING AND CUTTING TORCH** with 10 different size nickel-copper welding tips, 45° or 90° welding head with union nut (specify degree wanted!), 180° welding head (for "straight ahead" or "overhead" welding), 15-inch extension (for use in heavy welding) and removable cutting attachment with cutting tips A, B, C 55.00

4580D **STYLE K WELDING, CUTTING AND CARBON BURNING OUTFIT.** Same as Type 1, except that Style G Cutting Torch is furnished instead of Removable Cutting Attachment). Type 3 ..... 150.00

4580E **STYLE K WELDING AND CUTTING OUTFIT.** Same as Type 3, except without carbon burning torch. Type 4 ..... 147.50

4580F **OAK CARRYING CASE,** for either Types 1, 2, 3 or 4 outfits) .. 8.00

ECONOMY "L" LEAD-BURNING (OR LIGHT-WELDING) OUTFIT



No. 4581A

Designed especially for the wide range of "lead-burning" in storage battery repairs, etc., radiator repair work and hundreds of light welding operations requiring the use of a finely concentrated flame of highest temperature available.

Every part represents the acme of quality. Torch is built for service; scientifically and mechanically correct; embodies the same principles in construction which have established the superiority of Economy welding and cutting torches. May be used with either oxygen and acetylene or oxygen and hydrogen. Always specify when oxygen and hydrogen are to be used so correct type of regulators ma be furnished.

4581A **ECONOMY "L" LEAD-BURNING (OR LIGHT-WELDING) OUTFIT,** complete as illustrated above. Type 1 ..... $28.00

Users who have suitable regulators and gauges (such as are furnished with different welding outfits) do not require the No. 1 Outfit, complete. All required to change "welding outfit" into a "lead-burning outfit" is:

4581B **ECONOMY "L" LEAD-BURNING (OR LIGHT-WELDING) OUTFIT,** (consists of: Style "L" torch with tips, 2 six-foot lengths 3/16-inch Hose, 4 Hose Clamps and Bench-Block with needle valves 11.00

4581C **"L" TORCH WITH TIPS ONLY** 5.00

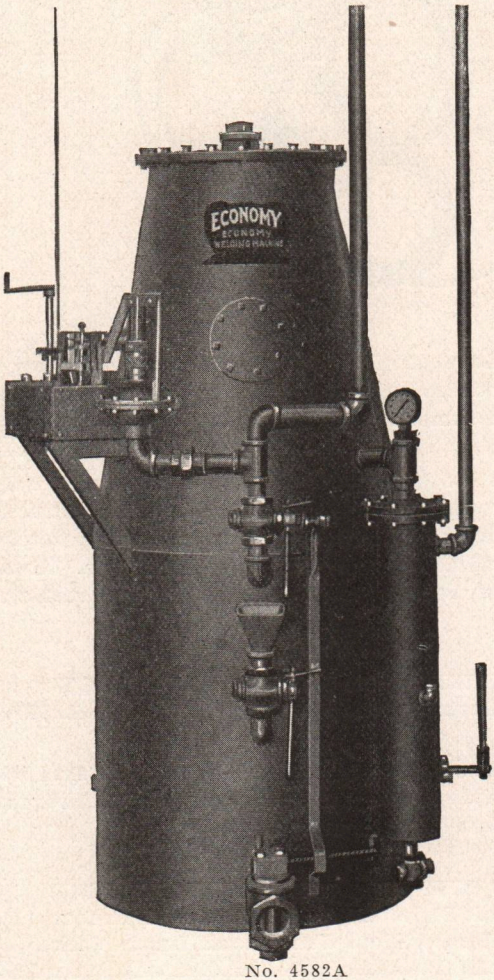
Yes, it's sold on the same "satisfaction-guaranteed or maney-back" basis like every Economy product.

Prices F. O. B. Factory.

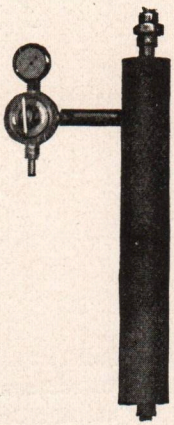
THE ECONOMY

"AUTOMATIC FEED" ACETYLENE GENERATOR.

The Acme of Acetylene Generator Perfection! The Final Achievement of Unceasing, Practical Study and Experiment Since 1910!



No. 4582A



The Economy "Automatic Feed Type" Acetylene Generators are furnished in the standard sizes shown in table below. Generators for special requirements "made to your order"; complete information furnished on request.

	Style Number	Carbide Capacity	Cubic feet acetylene produced per hour	Approximate number of torches Light work	Med. work	Heavy work	Weight Not crated	Shipping weight crated	*Price
4582A	30-A	30 lbs.	30	3	2	1	285	485	$245.00
4582B	50-A	50 lbs.	50	5	3	2	420	665	295.00
4582C	100-A	100 lbs.	100	8	6	4	760	985	395.00

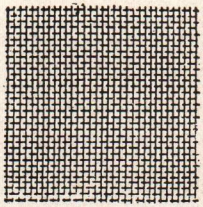
4582D Extra Welding Station with No. 17G Acetylene Regulator and "working pressure" gauge 20.00

4582E Extra Welding Station only 5.00

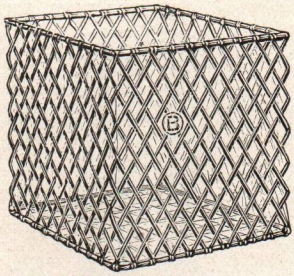
*Prices are complete with Welding Station; No. 17G Acetylene Regulator with "working pressure" gauge as illustrated.

WIRE

No. 4583A



No. 4583K



No. 4583B

BASKETS FOR TEST TUBES, NICELY FINISHED, TINNED IRON WIRE

4583A **WIRE BASKETS.** Circular.
5 in. diameter, 6 in. high $0.75
12 in. diameter, 6 in. high 1.60

4583B **WIRE BASKETS.** Rectangular.
5 inches by 4 inches by 6 inches ..... .50
4 inches by 5 inches by 4 inches ..... .50
10 inches by 6 inches by 6 inches high 1.40

4583C **WIRE, ALUMINUM,** all sizes. At best market prices.

4583D **WIRE, BRASS,** ¼-lb. spools.

Gauge B. & S.	16	18	20	22	24	26	28	30	32	34
Per spool	$0.40	.40	.40	.45	.50	.55	.60	.70	.85	1.10

4583E **WIRE, COPPER, BARE.**

Gauge B. & S.	16	18	20	22	24	26	28	30	32	34
¼-lb. spools	$0.40	.45	.50	.55	.60	.65	.70	.75	.85	1.10
1-lb. spool	$1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00		

4583F **WIRE, IRON.** Chemically pure, for standardizing. Per oz. $0.40

4583G **WIRE, MOLYBDENUM,** in any thickness. Price subject to market fluctuations.

4583H **WIRE, PURE NICKEL.** 14 B. & S.
Per ounce $0.45
Per pound 4.75

4583I **WIRE, PLATINUM.** See Platinum Ware.

4583J **WIRE, TUNGSTEN,** in any thickness. Price subject to market fluctuations.

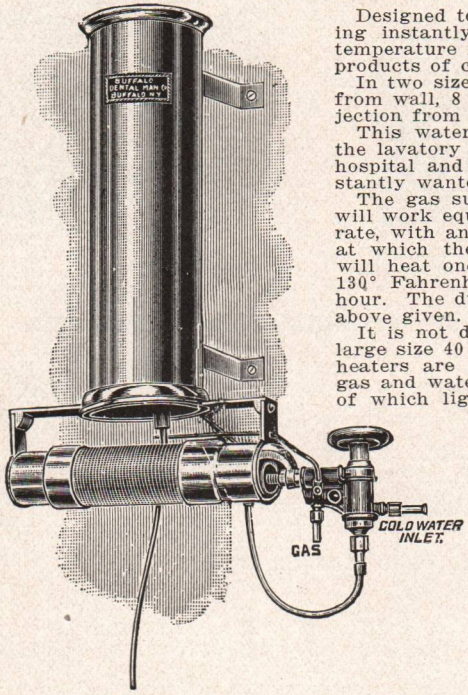
4583K **WIRE, GAUZE BRASS.** For heating beakers, dishes, etc., over flame. In squares. 20 mesh.

Size, inches	4	5	6	8
Each	$ .15	.25	.30	.65
Per dozen	$ 1.45	2.40	3.00	6.00
Per 100	$10.00	16.00	20.00	41.00

WATER HEATERS

FLETCHER'S INSTANTANEOUS WATER HEATERS

TYPES 147B AND 147E. INSTANTANEOUS WATER HEATER.



No. 4584A

Designed to hang over lavatory bowl or sink. Giving instantly a continuous supply of water at any temperature from boiling to lukewarm, free from the products of combustion, and suitable for all purposes.

In two sizes: large size, height 19 inches, projection from wall, 8 inches; small size, height 18 inches, projection from wall, 6 inches.

This water heater is more especially intended for the lavatory and the general odd work of laboratory, hospital and office purposes where hot water is constantly wanted quickly.

The gas supply should be from a ⅜-inch pipe. It will work equally well, but at a proportionately lower rate, with any gas supply, however small. The speed at which the water runs rules its temperature. It will heat one pint of water per minute from 50° to 130° Fahrenheit, or will boil 15 quarts of water per hour. The duty of the larger size is about double the above given.

It is not designed for baths. Consumption of gas: large size 40 feet, small size 20 feet per hour. These heaters are supplied with pilot light and a coupled gas and water tap, operated by a hand wheel, a turn of which lights the burner and gives an immediate flow of warm water. Made entirely of brass and copper, polished and nickel plated. Fitted to burn illuminating gas unless otherwise specified. No advance in price if ordered for natural gas. Full instructions for installing and operating accompany each heater.

PRICES

4584A	**WATER HEATER,** small size, with coupled taps and pilot light. Type 147B	$35.00
4584B	**WATER HEATER,** large size, with coupled taps and pilot light. Type 147E	45.00
4584C	With gasoline gas, extra	1.25
4584D	Wire Gauges, small, each	1.00
4584E	Wire Gauges, large, each	2.00

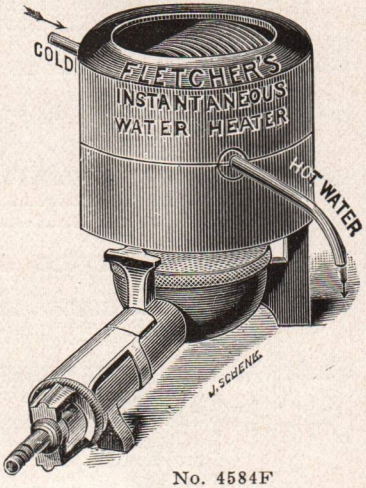
TYPE 240 INSTANTANEOUS WATER HEATER

An attachment to the Fletcher Burner Type 47. Total height 9 inches. This gives, when connected with a water tap, hot water in three seconds after the gas is lighted, either boiling, hot, warm or cold, the water being pure and fit for cooking purposes. In one minute it will deliver sufficient hot water for washing hands. It is simple, cheap, not liable to get out of order or wear, and is nearly equal in power to the small size Type 147 Instantaneous Water Heater. Gas supply required, ⅜-inch clear bore pipe and tap, to obtain the maximum power, at which it consumes about 60 feet per hour. It will work at a proportionate rate with any gas supply, however small.

If frequently used for long periods in a confined room, the products of combustion should be carried away. For illuminating gas unless otherwise specified. No advance in price for altering to natural gas.

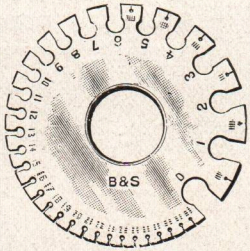
PRICES

4584F	With burner complete, as shown. Type 247	$12.00
4584G	Water Heater, without burner. Type 247	10.00
4584H	For gasoline gas, with wheel valve	15.00



No. 4584F

WIRE



No. 4585A

4585A **WIRE GAUZE, BROWN AND SHARPE** $3.75

4585B **WIRE GAUZE, BRASS.** For general use in sheets. Price on application.

Mesh	10	20	30	40	50	60
Diameter of wire	.023	.015	.011	.008	.008	.007
Mesh	80	90	100	120	150	200
Diameter of wire	.00575	.00525	.0045	.0037	.0026	.0021

4585C **WIRE GAUZE, COPPER.** For combustion, in sheets.

Mesh	20	30	40	60	80	100
Per square foot	$0.80	.90	1.00	1.10	1.20	1.80

4585D **WIRE GAUZE, IRON.** In sheets.

Mesh	6	10	20	30	40
Per square foot	$0.35	.40	.45	.55	.80

4585E **WIRE GAUZE, IRON.** For supporting dishes, etc. In squares, 20 mesh.

Size, inches	4	5	6	7	8
Each	$ .06	.10	.12	.16	.18
Per dozen	$ .60	1.00	1.20	1.60	1.80
Per 100	$4.00	6.00	7.00	9.00	10.00

4585F **WIRE GAUZE, CHROMEL.** Has high melting point, very resistant to oxidization. In squares.

Size, inches	4	5	6
Each	$0.45	.65	.95

4585G **WIRE GAUZE, IRON.** With asbestos center, for supporting dishes, etc. In squares.

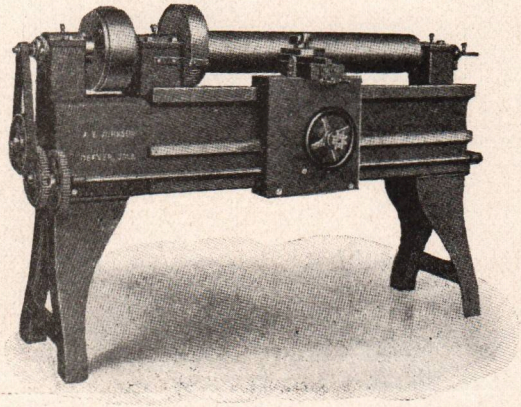
Size, inches	4	5	6
Each	$ .14	.16	.20
Per dozen	$ 1.35	1.60	1.80
Per 100	$10.00	12.00	13.00

4585H **WIRE GAUZE, PLATINUM.** See Platinum Ware.

4585I **WORM CAGES.** Price on application.

JOHNSON RAPID ZINC SHAVING LATHES

(PATENTED)



No. 4586A

4586A The experience gained in this work, together with some of the problems connected with the rapid and economical production of the highest grade of zinc shavings for cyanide work has resulted in the production of a machine that most fully answers all requirements and is now in use in some of the largest mills in the country.

The development of this new and successful machine has been based on the experience of many months spent in the production of zinc shavings for the market.

The lathe, as shown in the engraving, is of the type in which the shavings are cut from commercial sheet zinc, taking sheets 36 inches in width, which are wound on an arbor under pressure, the shavings being cut by a side tool fed automatically.

This process is not new, and is sometimes used by adapting an ordinary engine lathe to the service, but at best this is makeshift, as compared with a properly designed machine made for this purpose especially. For instance, the tool post arrangements are not suitable for attaching the pressure winding device; also the heat generated by the cutting expands the arbor, and if not attended to is likely to destroy the center. Again, there being no provision in the construction of the ordinary lathe for a clear fall for the shavings from the arbor, they are apt to become tangled or wound again, thus causing frequent stoppage.

THE WATER COOLING DEVICE

This important feature is worked out in a very simple and effective manner, the arrangement requiring no stuffing boxes and no parts subject to wear, and having capacity to maintain the arbor in a perfectly cool condition. This prevents the zinc from becoming heated, so as to produce a poor quality of shavings.

Among the advantages of this lathe we may note:

1. The use of plain commercial sheet zinc.
2. The exceedingly small percentage of waste.
3. The uniformity of product which can be maintained indefinitely.
4. The approved quality and strength of shavings produced, owing to the perfect cooling arrangements.
5. And last, but not least, the large capacity, the product per day of nine hours being from eight to nine hundred pounds of shavings cut to thickness of two and a half thousandths of an inch.

Prices and full information on application.

BLOW PIPE APPARATUS IN SETS

4587A **BRAUN'S QUALITATIVE BLOW PIPE OUTFIT.** This set is packed in varnished wood box, 12 inches long, 7 inches wide, 5 inches deep, outside measurements. Forty-eight different articles of apparatus and chemicals packed in bottles, boxes and recesses, neatly labeled and ready for use.

1. Anvil, Polished Steel
2. Brass Blowpipe
3. Agate Mortar
4. Alcohol Lamp.
5. Beaker
6. Clay Cylinder
7. Charcoal Stick
8. Evaporating Dish
9. 3 Porcelain Crucibles
10. Forceps, 5-inch
11. Forceps, Platinum Tip
12. Hammer
13. Horseshoe Magnet
14. Pipette
15. Platinum Wire Holder
16. 3 pieces Platinum Wire
17. Scissors
18. Horn Spoon
19. Test Lead Measure
20. 3 Open Tubes
21. 3 Closed Tubes
22. Magnifier, 1-inch
23. Blue Litmus Paper
24. Red Litmus Paper
25. Turmeric Paper
26. Brazil Wood Paper
27. Borax Glass
28. Borax Powder
29. Bone Ash
30. Antimony Oxide
31. Arsenous Acid
32. Salt Phosphorous
33. Soda Carbonate
34, Soda Nitrate
35. Alcohol
36. Ammonia Hydroxide
37. Hydrocloric Acid
38. Copper Oxide
39. Iron Oxide
40. Lead Oxide
41. Manganese Oxide
42. Mercury Oxide
43. Potash Bisulphate
44. Test Lead
45. Tin Oxide
46. Cobalt Nitrate Sol.
47. Nitric Acid
48. Sulphuric Acid

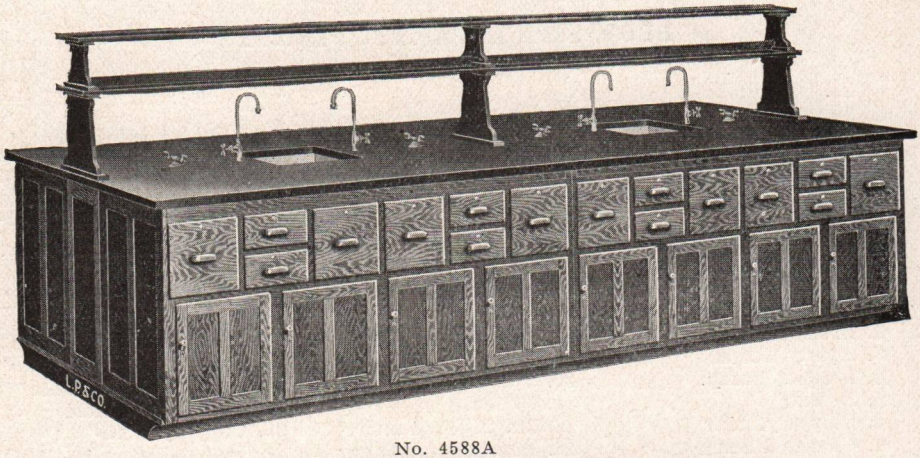
Price $20.00

4587B **BRAUN'S QUALITATIVE BLOW PIPE OUTFIT.** Similar to above bue measuring approximately 12 inches long, 7 inches wide, and 6½ inches deep, conveniently arranged with additional tray containing the following minerals in screw cap vials neatly labeled:

1. Graphite
2. Sulphur
3. Stibnite
4. Chalcopyrite
5. Galenite
6. Rutile
7. Pyrrhotite
8. Pyrite
9. Hematite
10. Magnetite
11. Chromite
12. Limonite
13. Siderite
14. Pyrolusite
15. Rrodonite
16. Sphalerite
17. Willemite
18. Corundum
19. Cryolite
20. Fluorite
21. Calcite
22. Apatite
23. Gypsum
24. Dolomite
25. Barite
26. Magnesite
27. Celestite
28. Strontianite
29. Halite
30. Quartz
31. Orthoclase
32. Witherite
33. Albite
34. Spodumene
35. Hornblende
36. Wollastonite
37. Beryl
38. Garnet
39. Mica
40. Lepidolite
41. Chrysolite
42. Scapolite
43. Tourmaline
44. Cyanite
45. Pyrophylite
46. Talc
47. Datolite
48. Prehnite
49. Pectolite
50. Stilbite

Price $25.00

STUDENTS' CHEMISTRY LABORATORY TABLE



No. 4588A

ARRANGED TO ACCOMMODATE 16 STUDENTS WORKING IN SECTIONS OF 8

This table has been manufactured by us nearly twenty-five years and has supplied a steady demand. It differs from many of our tables in that the piping of water, gas and waste is inside the table. The two soapstone sinks are placed in the center, as shown in the illustration. The plumbing is complete to floor line. This table is furnished in lengths of 6', 12', 18' and 24'.

SPECIFICATIONS

SIZE—12' long by 4' wide by 3' high.

TOP—1¾" thick birch, matched, glued, dressed and cleated to prevent warping. See illustration and description on page 8, or 1¼" thick soapstone.

MATERIAL AND CONSTRUCTION—Table is made of selected oak, constructed with mortise and tenon joints, to stand hard service. Doors and drawers are made with lap fronts in order to exclude dust. Drawers are of tenon and groove construction, with maple sides, full framed in bottoms, and extension at back to safeguard against dropping when pulled out. Reagent shelves are made with retaining rims. Table is provided with toe space. Back of cupboards is removable in order to give free access to the plumbing.

DRAWERS AND CUPBOARDS—Each student is provided with two drawers and one cupboard. Large drawers measure inside 15½"x9"x9½" deep; small drawers measure inside 15½"x11"x4" deep, and the cupboards measure inside 15¼"x17"x18" deep. Each cupboard is equipped with one shelf.

LOCKS—When ordered with locks, drawers and doors are equipped with high grade master keyed locks in sets of three. The three locks are alike, but each set is different. Master key to pass all locks is furnished. Each set of locks is marked with a brass number plate.

SINKS—Two soapstone sinks 6" deep by 14" by 16", equipped with special acid resisting lead waste plug and trap, and nickel plated overflow with beehive strainer.

PLUMBING—Plumbing consists of four nickel plated compression goose neck water cocks, two of which are furnished with standard ¾" hose connection, and eight nickel plated lever handle gas cocks with galvanized iron piping to floor line. Both the gas and the water lines are provided with shut-off valves near floor.

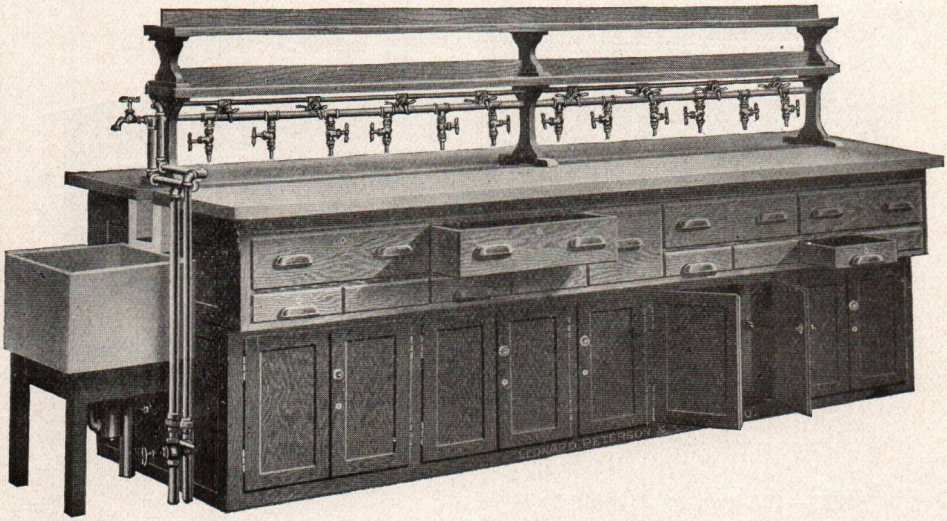
FINISH—Birch tops and reagent shelves are treated acid proof. Other exposed parts are finished antique (or any other shade when so ordered), with one coat of filler and three coats of varnish, hand rubbed. Inside of drawers are varnished. Inside of cupboards are oiled.

WEIGHT—Crated, with wood top, 1,900 lbs.; with stone top, 2,600 lbs.

PRICES F. O. B. CHICAGO

4588A	With wood top and master keyed locks. Type 910	$328.00
4588B	With wood top, but without locks. Type 911	268.00
4588C	With stone top and master keyed locks. Type 912	364.00
4588D	With stone top, but without locks. Type 913	304.00

LABORATORY TABLE



No. 4589A

STUDENTS' QUANTITATIVE AND ORGANIC LABORATORY TABLE ARRANGED TO ACCOMMODATE 8 STUDENTS

SPECIFICATIONS

SIZE—10′4″ long by 4′ wide by 3′ high.

TOP—1¾″ thick birch, matched, glued, dressed and cleated to prevent warping. or 1¼″ thick soapstone.

MATERIAL AND CONSTRUCTION—Table is made of selected oak, constructed with mortise and tenon joints, to stand hard service. Doors and drawers are made with lap fronts in order to exclude dust. Drawers are of tenon and groove construction, with maple sides, full framed in bottoms, and extension at back to safeguard against dropping when pulled out. Reagent shelves are made with retaining rims. Table is provided with toe space.

DRAWERS AND CUPBOARDS—Each student is provided with two drawers and one cupboard. Large drawers measure 6″x15″x24″; long drawers measure 3″x10″x42″, and the cupboards measure 18″x20″x25″. Each cupboard is equipped with one shelf. The two extra cupboards are convenient for storage of extra supplies, waste jars, etc. The two extra drawers have small divisions for cork supplies.

LOCKS—When ordered with locks, drawers and doors are equipped with high grade master keyed locks in sets of three. The three locks are alike, but each set is different. Master key to pass all locks is furnished. Each set of locks is marked with a brass number plate.

GUTTER AND SINK—Gutter is lead lined or soapstone, draining into sink at end of table, 5½″ wide by 2″ deep in the upper end, slanting down to 5″ at the sink. Sink is soapstone, 10½″ deep by 14″ by 18″, equipped with special acid resisting lead waste plug and trap, and nickel plated overflow with bee-hive strainer.

PLUMBING—Plumbing consists of twelve nickel plated compression water cocks with detachable hose nipples (by removing the hose nipple, a Richard's filter pump can be attached. We also furnish one reducer for the use of Chapman's filter pump), one nickel plated compression water cock threaded for regular ¾″ hose connection, and eight nickel plated lever handle gas cocks with galvanized iron piping to floor line. Exposed piping is aluminum bronzed. Each line is furnished with a shut-off valve near the floor.

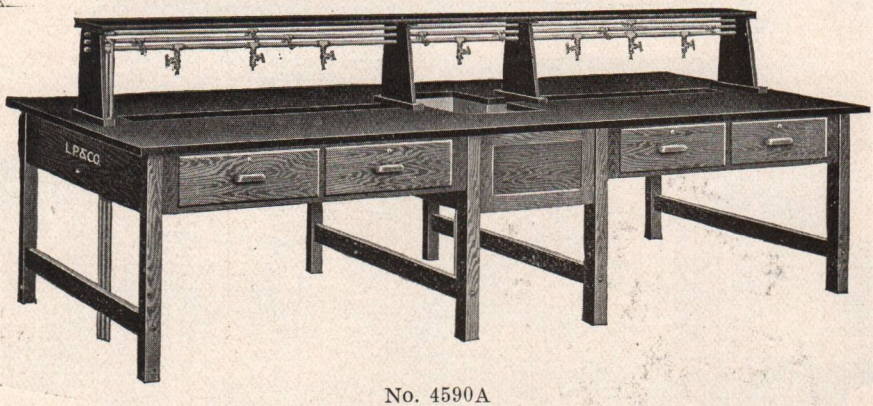
FINISH—Birch tops and reagent shelves are treated acid proof. Other exposed parts are finished antique (or any other shade when so ordered), with one coat of filler and three coats of varnish, hand rubbed. Inside of drawers are varnished. Inside of cupboards are oiled.

WEIGHT—Crated: with wood top, 1,140 lbs.; with stone top, 2,000 lbs.

PRICES F. O. B. CHICAGO

4589A	With wood top and master keyed locks. Type 965	$410.00
4589B	With wood top, but without locks. Type 966	380.00
4589C	With stone top and master keyed locks. Type 967	443.00
4589D	With stone top, but without locks. Type 968	413.00

COMMERCIAL LABORATORY TABLE



No. 4590A

SPECIFICATIONS

SIZE—12′ long by 4′ wide by 3′ high.

TOP—1¾″ thick birch, matched. glued, dressed and cleated to prevent warping; or 1¼″ thick soapstone.

MATERIAL AND CONSTRUCTION—Table is made of selected oak and solidly constructed to stand hard service. Legs are fastened to body of table with braces and bolts. Drawers are made with lap fronts in order to exclude dust. They are of tenon and groove construction, with maple sides, full framed in bottoms, and extension at back to safeguard against dropping when pulled out. Reagent shelves are made with retaining rims.

DRAWERS—Eight, four on a side, measuring inside, 23″x14″x5″.

LOCKS—When ordered with locks, drawers will be equipped with high-grade solid brass master keyed locks. Locks will be furnished all alike or all different, as may be required. Master key to pass all locks is furnished.

GUTTERS AND SINK—Gutters are lead lined or soapstone, draining into sink in center of table. Gutters are 5½″ wide. Sink is soapstone, measuring inside, 10″ deep x 14″x24″, equipped with special acid resisting lead waste plug and trap and nickel plated overflow with beehive strainer.

PLUMBING—Plumbing consists of seven nickel plated compression water cocks with detachable hose nipples (by removing the hose nipple a Richard's filter pump may be attached; a reducer for the use of Chapman's filter pump is also furnished', twelve nickel plated lever handle gas cocks, and four nickel plated lever handle air cocks with galvanized iron piping to floor. Exposed piping is aluminum bronze. Each line is furnished with a shut off valve near the floor.

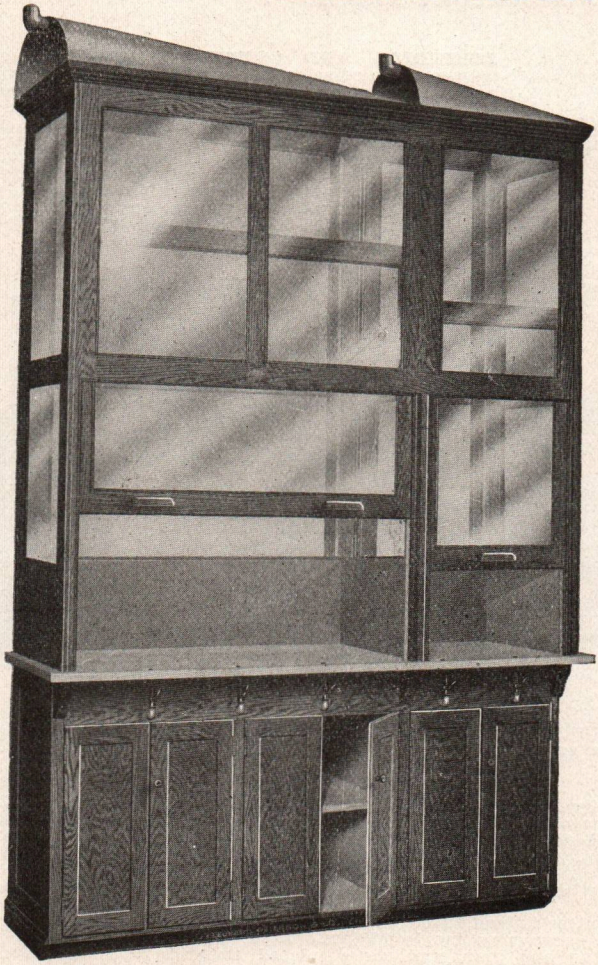
FINISH—Birch tops and re-agent shelves are treated acid proof. Exposed parts are finished antique (or any other shade when so ordered), with one coat of filler and three coats of varnish, hand rubbed. Inside of drawers are varnished.

WEIGHT—Crated: with wood top, 1,200 lbs.; with stone top, 2,000 lbs.

PRICES F. O. B. CHICAGO

4590A	With wood top, but without locks. Type 980	$220.00
4590B	With wood top and master keyed locks. Type 981	230.00
4590C	With stone top, but without locks. Type 982	256.00
4590D	With stone top and master keyed locks. Type 983	266.00

CHEMISTRY FUME HOOD



No. 4591A

The fume hood we now offer to our trade is an improvement which can be seen readily in illustration. Instead of exhausting the fumes from the center, as in former construction, the present method is to exhaust the fumes from the end outlet by connecting the same to flues. The top is made from terne plate. The hood is lined to a height of 12" from stone top with transite asbestos, which is water and acid proof. Gas cocks are placed on the front, with holes through top for hose connection. This arrangement permits the regulating of gas from the outside. Plumbing is complete to floor line. For blowers and fans see pages 44 and 45.

SIZE—6′ long by 2′ deep by 9′ high.

TOP — Soapstone, 1¼" thick.

MATERIAL AND CONSTRUCTION — Hood is made of selected oak constructed with mortise and tenon joints, to stand hard service. The hood is divided into two compartments with glass partition, the larger compartment being 4′ and the smaller compartment 2′. Compartments are lined to a height of 12" from stone top with transite asbestos, which is water and acid proof. Lift doors are balanced on weights. Solid bronze chains are used. Cupboard doors are made with lap fronts. Glass is double strength, best quality.

BACK — When ordered with back, hood is furnished with paneled back, or with glazed back when so specified on order.

VENTILATION—Tops of hoods are terns plate. This material, being part lead, will withstand the acid fumes better than any other kind of metal. The tops are rounded and provided with outlets at the ends which are to be connected to chimney of flue. Draft may be assisted by gas burner placed in the upper part of the hood. A blower is recommended where heavy gases are made and where a high velocity of air is required. See pages 44 and 45.

PLUMBING—Plumbing consists of five nickel plated lever handle gas cocks with piping complete to floor line. The gas cocks are placed on the front, with holes through top for hose connections. This arrangement permits the regulation of gas from the outside.

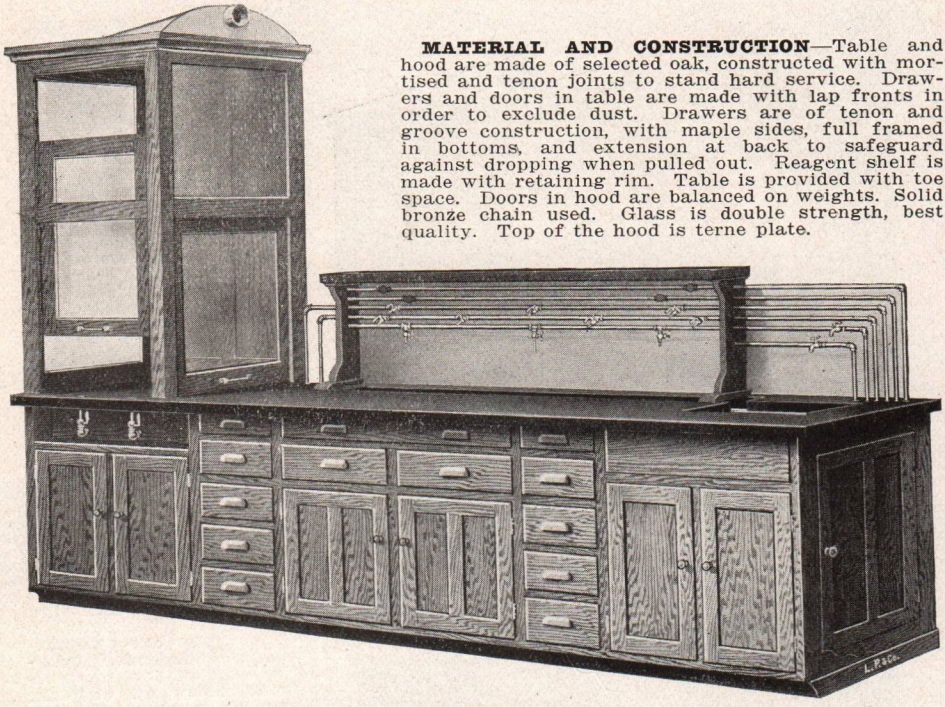
FINISH—Outside of hood is finished antique (or any other shade when so ordered) with one coat or filler and three coats of varnish, hand rubbed. Inside of compartments are aluminum bronzed.

WEIGHT—Crated: without back, 600 lbs.; with back, 675 lbs.

PRICES F. O. B. CHICAGO

4591A	As specified, without back. Type 1085	$145.00
4591B	As specified, with back. Type 1086	165.00
4591C	Small sink and water cock, extra	20.00

LABORATORY TABLE



MATERIAL AND CONSTRUCTION—Table and hood are made of selected oak, constructed with mortised and tenon joints to stand hard service. Drawers and doors in table are made with lap fronts in order to exclude dust. Drawers are of tenon and groove construction, with maple sides, full framed in bottoms, and extension at back to safeguard against dropping when pulled out. Reagent shelf is made with retaining rim. Table is provided with toe space. Doors in hood are balanced on weights. Solid bronze chain used. Glass is double strength, best quality. Top of the hood is terne plate.

No. 4592A

WALL TABLE AND HOOD

SPECIFICATIONS

SIZES—Table is 9′ long by 2′2″ wide by 3′ high. Hood is 2′x2′x8′2″ high.

TOP—1¾″ thick birch, matched, glued and dressed, or 1¼″ thick soapstone.

DRAWERS AND CUPBOARDS—Thirteen drawers of different dimensions. The large center drawer is 34″ long. Four cupboards of different dimensions, each equipped with one shelf.

LOCKS—When ordered with locks, drawers and doors are equipped with high grade locks all alike.

GUTTER AND SINK—Gutter is lead lined or soapstone, draining into sink at end of table. Sink is soapstone, measuring inside 10½″x14″x18″, equipped with special acid resisting lead waste plug and trap, and nickel plated overflow with bee-hive strainer.

PLUMBING—Plumbing consists of four nickel plated compression water cocks for cold water (these are supplied with detachable hose nipples and are threaded for filter pumps), one nickel plated compression water cock for hot water, five nickel plated lever handle gas cocks, and four nickel plated lever handle air cocks with galvanized iron piping to floor line. Exposed piping is aluminum bronzed. Each line is furnished with a shut-off valve near the floor.

ELECTRICITY—Table is supplied with two sockets for direct current and two sockets for alternating current. Wiring and conduit complete to floor line.

FINISH—Birch tops and re-agent shelves are treated acid proof. Other exposed parts are finished antique (or any other shade when so ordered), with one coat of filler and three coats of varnish, hand rubbed. Inside of drawers are varnished. Inside of cupboards are oiled.

WEIGHT——Crated: with wood top, 1,000 lbs.; with stone top, 1,600 lbs.

PRICES F. O. B. CHICAGO

4592A	With wood top and master keyed locks. Type 1025	$330.00
4592B	With wood top, but without locks. Type 1026	310.00
4592C	With stone top and master keyed locks. Type 1027	350.00
4592D	With stone top, but without locks. Type 1028	330.00
4592E	If electricity is omitted deduct	15.00

LABORATORY EQUIPMENT
Estimated for Twelve Students

SCALES, BALANCES AND WEIGHTS

1 Union Scale with two Platforms, scoop capacity from ½ oz. to 30 lbs. Platform capacity up to 240 lbs.; size of platform, 10½x13½ inches.

1 Moisture Scale, beam graduated in percentages and pounds, very accurate.

3 Scale Covers of Rubber Sheeting, dustproof, made to fit balances.

3 Sets (Gramme Weights), 50 grammes to 1 milligramme, and three riders.

3 Becker's Type 8A Short Beam Analytical Balances (patented), for a charge up to 200 grammes in each pan and sensible to 1-20 milligramme. In French polished mahogany and glass case, front sliding frame counterpoised, with glass top to admit more light to rider. All parts of the balance are mounted and fastened on plate glass 5-16 inch thick so that nothing can get out of order through warping of the wood. All bearings are agate planes with agate knife edges, and the beam is graduated in 1-10 milligramme and in such a manner that the rider can be placed on the centre of the beam and used from the O point to either end of the beam. Provided with new improved arrangement for arrest of pans and beams, riders, apparatus for specific gravity and for weighing tubes. Pans 2⅜ inches in diameter; width of pan support 4 inches, can be made wider if desired.

3 Ainsworth Analytical Balances, Type Q, 7-inch beam; sensibility, 1-20 milligramme; capacity, 200 grammes, hard rolled nickeled aluminum beam, agate edges and bearings, double rider, skeleton hangers, two level vials in base, plate glass covering entire base, all metal work gold-plated except center bearings and drop levers, polished mahogany case, dimensions, 20x20x10 inches; weight, packed, 60 pounds.

PORCELAIN WARE

18 Casseroles, porcelain, capacity, 4 oz.

18 Casseroles, porcelain, capacity, 8 oz.

18 Color Test Plates, with 12 cavities; size, 3¼x4¼ inches.

54 Crucibles, Porcelain, with covers, glazed inside and outside, Type OO; size, 1¼ inch; capacity, ½ oz.

18 Crucibles, Porcelain, with covers, glazed inside and outside, Type 2; size 2-inch; capacity, 1¾ oz.

18 Evaporating Dishes, Porcelain, glazed inside, with heavy rim, Type 9; capacity, 12 oz.

18 Gooch Crucibles, Porcelain, with perforated bottom, and cover.

PLATINUM WARE

5 Feet Type 27 Platinum Wire.

6 Platinum Crucibles, with covers, best hammered ware; capacity, 15 cc's; weight, 15 grammes each.

1 Platinum Cylinder and Spiral for quantitative determination of copper by electrolysis; cylinder, 2x1 inch; total weight, about 20 grammes.

LABORATORY EQUIPMENT—Continued

Glassware

36 Nests, Type 1 to 6, Bohemian style, Griffin's Lipped Beakers.

12 Sets Reagent Bottles of 12 each, made from glass containing no lead, zinc or other metallic flux; with raised letters ground on the surface, giving name and formula of reagent. Each set to consist of:

1 Hydrochloric Acid, Conc.
1 Hydrochloric Acid, Dil.
1 Acetic Acid.
1 Sulphuric Acid, Conc.
1 Sulphuric Acid, Dil.
1 Nitric Acid, Conc.
1 Nitric Acid, Dil.
1 Ammonium Hydroxide.
1 Ammonium Chloride.
1 Ammonium Sulphide (Amber).
I Potassium Hydroxide.

All of the above bottles to be of 8 oz. capacity.

3 Sets Reagent Bottles of four each, similar to above, except to consist of:

1 Ammonium Hydroxide.
1 Sulphuric Acid.
1 Nitric Acid.
1 Hydrochloric Acid.

All of above bottles to be of 16 oz. capacity.

2 Sets of Reagent Bottles of 4 oz. capacity, as follows:

1 Hydrogen Sulphide.
1 Potassium Ferrocyanide.
1 Potassium Sulphocyanide.
1 Potassium Carbonate.
1 Potassium Sulphate.
1 Potassium Iodide.
1 Potassium Ferricyanide.
1 Potassium Hydroxide.
1 Ammonium Sulphide.
1 Ammonium Chloride.
1 Ammonium Carbonate.
1 Ammonium Oxalate.
1 Sodium Phosphate.
1 Barium Chloride.
1 Calcium Chloride.
1 Calcium Sulphate.
1 Calcium Hydroxide.
1 Magnesium Sulphate.
1 Mercuric Chloride.
1 Silver Nitrate.
1 Lead Acetate.
1 Ferrous Sulphate.
1 Ferric Chloride.
1 Alcohol.
1 Ammonium Sulphocyanide.
1 Barium Hydroxide.
1 Barium Carbonate.
1 Ether.
1 Cupric Sulphate.
1 Sodium Carbonate.
1 Sodium Hydroxide.
3 Blank Label Bottles.

3 Doz. 1-gallon Green Glass so-called Acid Bottles, for storage of standard solutions.

3 Doz. Bottles, 2 oz., extra wide mouth, flint glass, for salts.

15 Dropping Bottles, indicator containers.

18 Wash Bottles, 24 oz., complete with rubber stoppers and glass tubes.

LABORATORY EQUIPMENT—Continued

Glassware

27 Burettes, Mohr's, with Geissler's Glass Stopcock, 50 cc. capacity. Graduated in 1-10 cc.
18 Funnel Tubes, bent, thistle top.
7 Pounds Soft Glass Tubing, 5 mm. o. d.
7 Pounds Soft Glass Tubing, 7 mm. o. d.
4 Pounds Soft Glass Rods, 5 mm. o. d.
9 ½-gallon Percolators, conical form, flint glass.
18 Volumetric Pipettes, most accurately graduated; capacity, 10 cc.
9 Volumetric Pipettes, most accurately graduated; capacity, 25 cc.
3 Sulphuretted Hydrogen Generators, Kipp's form.
4½ Gross Test Tubes, best glass, well annealed, free from lead, each piece wrapped in paper, 6x⅝ inches.
4½ Gross Test Tubes, best glass, well annealed, free from lead, each piece wrapped in paper, 3x⅜ inches.
9 Filter Flasks, conical, with side neck, for use with filter pump; capacity, 8 oz.
18 Graduated Cylinders, with lip, double graduation in cc. up and down; capacity, 50 cc.
3 Graduated Clyinders with lip, double graduation in cc. up and down; capacity, 500 cc.
2 Graduated Cylinders with lip, double graduation in cc. up and down; capacity 1000 cc.
18 Scheibler's Desiccators, with knob top, diameter 6 inches.
54 Copper Determination Flasks, made of resistance glass, pear shape, wide mouth and broad flange; capacity, 8 oz.
18 Erlenmeyer Flasks, resistance glass; capacity, 4 oz.
18 Erlenmeyer Flasks, resistance glass; capacity, 6 oz.
12 Volumetric "Litre Flasks," graduated; capacity, 1000 cc.
12 Volumetric "Litre Flasks," graduated; capacity, 250 cc.
36 Bunsen Funnels, with thin and extra long stems, top ground even and stem ground to a point. Angle, 60°; diameter 2½ inches.
36 Bunsen Funnels, with thin and extra long stems, top ground even and stem ground to a point. Angle, 60°; diameter, 3 inches.
9 Funnels; diameter 8 inch, best glass.
2 Thermometers, Chemical, scale engraved on stem, with white back, very exact, graduated to 200° C.

LABORATORY EQUIPMENT—Continued

Glassware

9 Potash Bulbs, Geissler's, plain, for steel analysis.
18 Calcium Chloride Tubes, Volhard's; length, 5 inches.
18 Gooch Filtering Tubes for Gooch Crucibles.
72 Watch Glasses, well annealed, with ground edges; diameter, 2½ inches.
72 Watch Glasses, well annealed, with ground edges; diameter, 3 inches.
72 Watch Glasses, well annealed, with ground edges; diameter, 4 inches.
72 Watch Glasses, well annealed, with ground edges; diameter, 5 inches.
3 Sets, 4 each, Scale Feet, for holding leveling screws of balances, giving perfect insulation.

Ironware

2 Bunsens Blast Lamps for Gas, improved form.
18 Bunsen Burners, usual size, with air regulation.
2 Fletcher's Radial Burners, for hood purposes.
2 Richards Filter Pumps.
1 Electric Hot Plate, three heats, from 100° to 600°F.; size, 12x24 inches.
2 Pairs Pliers, side cutting, steel; length, 5 inches.
18 Sand Baths, sheet iron, shallow; diameter, 4 inches.
2 Nest Sieves, 10, 20, 30, 40, 60, 80, 100, 120, 150, 200 mesh, ten in each nest; diameter, 8 inches.
18 Spatulas, steel, with cocoa wood handles; blade, 4 inches.
12 Rectangular Base Ring Stands for Flasks, retorts, etc., complete with 2, 3 and 4 inch rings.
12 Burette Clamps, with set screws to attach to retort stand.
18 Triangular Files; length, 4 inches.
36 Iron Tripods for Bunsen Burners.
18 Crucible Tongs, rod iron, double bent, Jap.; length, 9 inches.

Woodenware

18 Burette Supports, hardwood clamp, lined with cork, holding two burettes each.
18 Funnel Supports, one double arm, four funnels.
12 Test Tube Racks, for 13 tubes, in two shelves, with 7 pins and ⅞-inch holes.

LABORATORY EQUIPMENT—Continued

Rubber Material

2 Fletcher's Blowers, Foot Bellows, gives continuous blast of air; No. 9; diameter, 7¼ inches.

9 Yards Black Rubber Sheeting, vulcanized on muslin.

8 Lbs. Rubber Stoppers, assorted, solid, 1 and 2 holes.

60 Feet 3/16-inch Pure Gum Rubber Tubing; 60 feet ¼-inch pure gum rubber tubing.

60 Feet ¼-inch Rubber Tubing, white, light wall, hand made, for gas connections.

4 Feet Gooch Rubber Tubing, band, pure gum, light wall, for Gooch crucibles.

Miscellaneous

18 Brushes, Bristle, for test tubes, with sponge ends for protection to test tube ends.

6 Brushes, Bristle, for burettes; length, 36 inches.

18 Camel Hair Brushes, extra large stock, quill holder, ½-inch.

20 Boxes Gummed Labels, colored rims, No. 261; 20 boxes gummed labels, colored rims, No. 201.

1 Agate Mortar, with pestle; size, 3½ inches.

1 Ralston New Process Still, of copper-plated pure block tin, with pura germ-proof aerating cap.

18 Test Tube Clamps, of spring wire, for all sizes test tubes.

18 Chaddock Beaker Clamps, of Japanned spring wire, rubber covered jaws.

36 Pinch-Cocks, nickel plated, strong spring.

30 Clamps for Tubing; width, 1¼ inches.

5 Gross Assorted Corks.

12 Nickel Crucibles of pure nickel for alkaline fusions.

2 Drying Ovens, single wall of copper, with opening for thermometer, movable shelf and extra sheet iron bottom.

36 Pkgs. S. & S. "White Ribbon" Filter Paper, washed with hydrochloric and hydrofluoric acids, quick filtering and retaining $BaSO_4$; diameter, 9 cm.; 36 pkgs. same, 7 cm.

18 Pipe Stem Triangles, improved form, small; 18 same, medium.

18 Wire Gauze, with asbestos center, 6 inches square.

For Laboratory Furniture, see special section, pages 422, 423, 424.

NOTE:—It is impossible to select an outfit adaptable to every one's wants, therefore, we have endeavored to give but a general idea of what will be required, and you can add or omit any items or change the amounts to suit your requirements.

SET OF BLOW PIPE APPARATUS

AS DESCRIBED IN "BROWN'S MANUAL OF ASSAYING"

4598A

1. 1 Charcoal Borer, Club Shape.
2. 1 Charcoal Borer with Spatula.
3. 1 Charcoal Saw.
4. 1 Chamois Skin.
5. 1 Camel Hair Brush.
6. Coal and Ash Trays.
7. ½ Dozen Charcoals.
8. 1 Diamond Steel Mortar.
9. 1 Set (3) Porcelain Dishes.
10. 1 Pair Platinum Pointed Forceps.
11. 1 Pair Heavy Tip Steel Forceps.
12. 1 Pair Steel Forceps.
13. 1 Glass Alcohol Lamp.
14. 6 Glass Tubes.
15. 2 Books Test Papers.
16. Frame with 18 Glass-stoppered and Labelel Reagent Bottles, containing the following Reagents:

Borax Powder.	Borax Glass.	Boracic Acid, Fused.
Boracic Acid, Cryst.	Bismuth Flux	Bisulphate Potash.
Bone Ash, Sieved.	Bone Ash, Washed.	Carbonate Soda.
Charcoal.	Copper Oxide.	Phosphorous Salt.
Plattner's Flux.	Potash Oxalate.	Salt.
Soda Nitrate.	Test Lead.	Tin.

17. 1 Knife.
18. 1 Pair Nippers.
19. 1 Set Moulds and Stamps.
20. 1 Steel Chisel.
21. 1 Pair Scissors.
22. 1 Matrass Holder.
23. 1 Platinum Tip for Blow Pipe.
24. 1 Plattner's Blow Pipe N. P.
25. 1 Steel Hammer, Wire Handle.
26. 1 Plattner's Blow Pipe Lamp with Swivel.
27. 1 Platinum Holder, with 6 Wires.
28. 1 Double Lens.
29. 1 Dropping Pipette.
30. 6 Mattrasses.

PRICES ON APPLICATION

PROSPECTOR'S BLOW PIPE OUTFIT No. 1

4598B

1 Alcohol Lamp.
1 Chamois Skin.
3 Carbon Sticks.
1 dozen Test Tubes, 3-inch.
1 doz. Glass Tubes and Rods, Asst'd.
2 drs. Ferrous Sulphate.
2 drs. Borax Glass.
2 drs. Oxalic Acid.
2 drs. Sodium Carbonate, Dry.
2 drs. Carbonate Potash.
½ doz. Charcoals.
1 Funnel Glass, 2-inch.
1 H. S. Magnet, 3-inch.
1 Jeweler's Blow Pipe N. P.
1 Magnifying Glass Lens, Double.
1 Piece Iron Wire.
1 Platinum Wire and Holder.
1 Porcelain Mortar, 2¼ inch.
2 Porcelain Crucibles.
2 Porcelain Crucible Covers.
1 Pkg. Filter Paper.
3 Small Beakers, 0 to 000.
1 oz. Muriatic Acid C P. Conct.
1 oz. Sulphuric Acid C. P. Conct.
4 oz. Alcohol.
2 oz. Mercury.
2 oz. Granulated Lead.
¼ lb. Nitric Acid, C. P. Conct.
¼ lb. Ammonia, Strong.
1 Piece Tinfoil.
1 Piece Copper Wire.
1 Piece Sheet Zinc.
1 Spatula, 3 inches.
1 Pair Slag Forceps.

PRICES ON APPLICATION

PROSPECTOR'S BLOW PIPE OUTFIT No. 2

4599A

1 Anvil.
1 Agate Mortar, 1½-inch.
2 Porcelain Dishes.
2 Glass Funnels.
1 Doz. Test Tubes.
1 Doz. Glass Tubes and Rods.
3 Small Beakers.
1 Bone Spoon.
1 Dr. Potash Bisulphate, C. P.
1 Dr. Copper Oxide, C. P.
1 Dr. Copper Sulphate.
1 Dr. Calcium Carbonate.
1 Dr. Oxalic Acid.
1 Dr. Silver Nitrate.
2 Drs. Sodium Carbonate, dry, C. P.
2 Drs. Borax Glass.
2 Drs. Microcosmic Slat, C. P.
2 Drs. Lead, Finely Powdered, C. P.
2 Drs. Lead Flux.
1 Piece Silver Foil, C. P.
1 Piece Tin Foil, C. P.
1 Piece Copper Foil, C. P.
1 Piece Copper Wire.
1 Piece Zinc Sheet.
1 Piece Magnesium Ribbon.
1 Spool Iron Wire, Pure.
1 Pair Forceps.
1 Magnet, 3-inch.
1 Hammer.
1 Platinum Wire and Holder.
2 Books Litmus Paper.
1 Sheet Turmeric Paper.
2 Ozs Muriatic Acid, C. P., Conct.
½ Lb. Nitric Acid, C. P., Conct.
2 Ozs. Sulphuric Acid, C. P. Conct.
2 Ozs. Ammonia, Conct.
2 Ozs. Mercury.
½ Lb. Bone Ash.
½ Pt. Alcohol.
½ Doz. Charcoals.
1 Pocket Magnifying Lens, Double.
1 Pair Platinum Pointed Forceps.
1 Oil Lamp (Berzelius).
1 Alcohol Lamp.
1 Plattner's Blow Pipe and Platinum Tip.

PRICES ON APPLICATION

COMPLETE ASSAY OUTFIT FOR MINE

4599B

1 Gold Button Balance.
1 Silver Button Balance.
1 Anaytical Balance.
1 Bullion Balance.
1 Set Weights, 1 Grm. to 1-10 Mg.
1 Pulp Balance.
1 Set Weights, 50 Grm. to 1 Mg.
1 Set Weights, 1 A. T. to 1-20.
16 Glass Scale Feet.
4 Rubber Balance Covers.
1 Moisture Scale, 1 Kg.
1 Union Flux Scale.
6 C. H. Pencils, Med.
1 C. H. Brush, ½ inch. Round Quill.
1 C. H. Brush, 1 inch, H. R. B.
1 Test Tube Brush, ¾-inch.
2 Buckboard Brushes, 4 inches.
1 Buckboard Cleaning Brush.
2 Button Brushes.
1 Doz. Annealing Cups.
1 Annealing Cup Tray.
4 Burettes, 50 cc. 1-10 G. S.
4 Burette Caps.
2 Burette Floats.
1 Slag Anvil, 6x6 inches.
1 Sheet Asbestos Board, 40x40x¼ in
1 Blast Lamp.
1 Doz. Griffin Beakers, No. 1.
2 Doz. Griffin Beakers, No. 2.
1 Doz. Griffin Beakers, No. 3.
2 Doz. R. B. Crucibles, No. 00.
6 Spun Iron Crucibles, 1 oz.
1 Jeweler's Blow Pipe.
3 Doz. Taper Corks, Med., Asst'd.
6 Bottles G. S., 500 cc.
6 Bottles G. S., 500 cc. Amber.
2 Dropping Bottles, Schuster's, 1 oz.
3 Wash Bottles, 1000 cc.
6 Reagent Bottles, 8 oz.
6 Casseroles, R. B. No. 2.
6 Casseroles, R. B. No. 3.
6 Watch Glasses, 3-inch.
6 Watch Glasses, 3½-inch.
1 Button Tray.
1 Test Tube Clamp.
2 Hoffman Clamps, Med.
3 Mohr's Pinch-Cocks, Med.
1 Pair Asbestos Mittens.

COMPLETE ASSAY OUTFIT FOR MINE

CONTINUED

1 Samson Crusher, 00 Hand or Power.
1 Disc Sample Grinder, McCool.
1 Disc Sample Grinder, Braun.
2 Buckboards, 20x24 inches.
2 Mullers and Handles.
3 Percolators, ½-Gal.
2 Pipettes, Vol. 10 cc.
1 Pipette, Vol. 25 cc.
1 Pipette, Vol. 50 cc.
1 Pair Button Pliers.
1 Pair Cutting Pliers.
1 "Covers" Respirator.
6 Roasting Dishes, 6-inch.
1 Metal Roll, No. 2.
½ Lb. Rubber Stoppers, Asst'd.
12 Ft. Pure Gum Tubing, $\frac{3}{16}$-in. Med.
6 Ft. Pure Gum Tubing, ¼-in. Med.
2 Ft. Pure Gum Tubing, ½-in. Med.
2 Yds. Rubber Sheeting, Black.
1 Sampler and Scoop, 12x12 inch.
2 Doz. Tin Sample Pans, 6-in. Diam.
½ Doz. Sheet Iron Sample Pans, 6x9.
2 Horn Scoops.
3 Sand Baths, 6-inch
1 Pair Hand Shears, 9-inch Blade.
1 Pair Tinner's Snips, 2½-inch.
1 Nest Sieves, 8-inch Diameter; Nos. 20, 30, 40, 50, 60, 80, 100, 120, 150 and 200.
1 Doz. Erlenmeyer Flasks, 6-oz.
1 Doz. Copper Flasks, 1 Liter.
2 R. N. Flasks, 1 Liter.
1 Doz. Parting Flasks, 1 oz.
1 Volumetric Flask, 500 cc.
1 Volumetric Flask, 1000 cc.
2 Spatulas, 4 inches.
1 Spatula, 6 inches.
1 Spatula, 8 inches.
1000 Weaver Mailing Envelopes, 2oz.
1000 Union Ore Bags.
50 Duck Ore Bags, 6x10 inches.
5 Pairs Forceps.
1 Ralston Still.
1 Steel Gold Pan.
1 Kipp H_2S Generator, 1000 cc.
1 Agate Mortar, 3 inches.
1 Pestle for same.
1 Leeds Mortar.
1 Wedgewood Mortar.
1 No. 3 Pestle for same.
3 Glass Y Tubes, ¼ inch.
3 Glass T Tubes, ¼ inch.
1 Braun Cupel Machine, 1¼ & 1½ in.
1 Brass Cupel Mould, 1¼ inches.
1 Cupel Tray.
1 Cupel Shovel.
1 Cupel Rake.
1 Scheibler Dessicator, 6 in. & Plate.
1 Graduated Cylinder, 25 cc.
1 Graduated Cylinder, 100 cc.
1 Graduated Cylinder, 250 cc.
1 Set Steel Letters, ⅛ inch.
1 Set Steel Figures, ⅛ inch.
½ Doz. R.B. Evaporating Dishes, No. 1.
½ Doz. R.B. Evaporating Dishes, No. 6.
½ Doz. R.B. Evaporating Dishes, No. 9.
1 Bbl. Crucibles, 15 Gr.
1000 Scorifiers, 2½ inch, Colorado.
2 Triangular Files, 5 inch.
1 Round File, 6 inch.
1 Drying Oven, 8x10 inches.
1 Support for same.
500 Filter Papers, 11 cm.
500 Filter Papers, 18 cm.
100 Filter Papers, B and A Double Washed, 9 cm.
1 Doz. Bunsen Funnels, 2¾ inch.
¼ Doz. German Funnels, 4 inch.
1 Slag Hammer, 1-3-16 lbs.
1 Slag Hammer, 8 oz.
2 Chadduck's Burette Supports.
1 Funnel Support for 15 Funnels, Wooden.
1 Wooden Funnel Support.
1 Test Tube Support for 12.
2 Doz. Test Tubes 5x⅝ inches.
1 Pouring Mould, 12-Hole.
1 Pouring Mould, 6-hole, Heavy.
1 Lb. Sealing Wax.
1 Electric Hot Plate, 12x18 inches.
1 Gasoline Stove, 2 Burners.
1 Colorado Muffle Furnace LD.
4 Colorado Muffles, LD, 10¾x16x6.
1 Blow Pipe Tank complete, 8-gal., ready for use.
1 Cary Burner, 2-inch.
1 Chemical Thermometer, 250°C.
1 Magnifier, Double Lens.
3 Precipitating Jars, 1 qt.
1 Lb. Glass Tubing and Rods.
1 Pair Crucible Tongs, 9-inch, N. P.
1 Pair Crucible Tongs, 9-inch, Steel.
1 Pair Scorifier Tongs, 36-inch, for 2½-inch Size.
1 Pair Scorifier Tongs, 36-inch, for 3-inch Size.

COMPLETE ASSAY OUTFIT FOR MINE

Concluded

1 Pair Cupel Tongs, 36 inch.
6 Pipe Stem Triangles.
1 Iron Support, 3 Rings.
1 Tripod, 3 Rings.
1 Cupel Mallet, Rawhide.
2 Pencils for Glass.
1 Hydrometer for Heavy Liquids.
1 Hydrometer for Light Liquids.
1 Copper Water Bath.
1 Lead Measure.
1 Set Cork Borers, Nos. 1 to 6.
3 Boxes Gummed Labels.
1 Doz. Watch Glasses, 3½ inch.
2 Doz. Watch Glasses, 4 inch.
1 Doz. Watch Glasses, 4½ inch.
2 Alcohol Lamps, Brass, 8 oz.
1 Dangler Lamp.
1 Color Plate, 12 Cavities.
5 Lbs. Zinc Shavings.
½ Lb. Zinc, Granulated, C. P.
½ Lb. Zinc Oxide, C. P.
1 Oz. Lead Sulphate, C. P.
10 Lbs. Lead Acetate, Comm'l.
1 Lb. Lead Acetate, C. P.
50 Lbs. Lead, Granulated, C. P.
8 Lbs. Ammonia, C. P.
1 Oz. Uranium Acetate, C. P.
100 Lbs. Litharge, C. P.
21 Lbs. Nitric Acid, C. P.
½ Lb. Stannous Chloride, C. P.
1 Keg Soda Bicarbonate.
1 Oz. Silver Foil, C. P.
5 Lbs. Lead Foil, C. P.
50 Lbs. Potash Carbonate.
50 Lbs. Borax Glass.
200 Lbs. Bone Ash.
10 Lbs. Argols.
½ Lb. Tin, Granulated, C. P.
12 Lbs. Hydrochloric Acid, C. P.
¼ Lb. Sodium Phosphate, C. P.
½ Lb. Sodium Carbonate, Anhyd., C.P.
½ Lb. Sodium Hyposulphite, C. P.
9 Lbs. Sulphuric Acid, C. P.
2 Lbs. Iron Sulphide.
¼ Lb. Copper Sulphate, C. P.
1 Oz. Silver Nitrate, C. P.
¼ Lb. Manganese Sulphate, C. P.
1 Lb. Acetic Acid, C. P., 99½%.
10 Lbs. Silica Powder.
1 Oz. Copper Foil, C. P.
1 Oz. Iron Wire, C. P.
½ Lb. Reddle.
2 Books Litmus Paper.
½ Lb. Potassium Permanganate, C. P.
¼ Lb. Potassium Bichromate, C. P.
¼ Lb. Potassium Iodide, C. P.
¼ Lb. Potassium Bichromate, C. P.
½ Lb. Potassium Ferrocyanide, C. P.
¼ Lb. Potassium Ferricyanide, C. P.
½ Lb. Potassium Carbonate, C. P.
½ Lb. Potassium Caustic, C. P., by Alc.
½ Lb. Potassium Chlorate, C. P.
2 Lbs. Potassium Cyanide, Merck. Pure
½ Lb. Oxalic Acid, C. P.
¼ Lb. Ammon. Sulphate, C. P.
1 Lb. Ammon. Acetate, C. P.
¼ Lb. Ammon. Oxalate, C. P.
½ Lb. Ammon. Carbonate, C. P.
1 Oz. Ammon. Molybdate, C. P.
1 Lb. Ammon. Chloride, C. P.
¼ Lb. Aluminum Sheet, C. P.
¼ Lb. Tannic Acid, C. P.
1 Lb. Tartaric Acid, C. P.
1 Gal. Alcohol, 96%.
1 Lb. Barium Chloride, C. P.
1 Lb. Barium Chloride, Granulated, for Desiccator.

In the above we have made an effort to select an outfit that will answer every requirement in a complete assay office. Make your selection from it add items not listed, and mail to us for our net prices. This list contains many duplicates; you can omit any not required. "We guarantee satisfaction."

ASSAY OUTFIT FOR PROSPECTORS

4602A

6 Annealing Cups.
2 Hammers.
1 Portable Button Balance and Weights.
1 Pulp Balance and Weights.
1 Tripod.
1 Pint Alcohol.
3 Funnels.
1 Pkg. Filter Paper.
1 Button Brush.
4 Lbs. Litharge.
2 Lbs. Lead Flux.
10 Lbs. Bone Ash.
10 Lbs. Granulated Lead, C. P.
½ Lb. Rolled Lead, C. P.
5 Lbs. Soda Bicarbonate.
2 Lbs. Borax Glass.
1 Lb. Argols.
1 Lb. Nitric Acid, C. P.
¼ Oz. Silver Foil, C. P.
1 Lb. Muriatic Acid, C. P.
6 Parting Flasks.
1 Quart Mortar and Iron Pestle.
2 Pair Tongs.
1 Blow Pipe, Plattner's.
1 Furnace ("Brown or Burro") or
1 Gasoline Furnace with Blow Pipe Tank.
1 Spatula.
Glass Rod and Tubes.
3 Beakers and Covers.
1 Sieve, 60 Mesh.
1 Magnet.
1 Wash Bottle.
1 Glass Alcohol Lamp.
3 Pairs Pliers.
1 Magnifying Lens.
50 Crucibles.
2 Muffles.
200 Scorifiers.
1 Lead Mould.
1 Cupel Mould.

In the above list we have figured on standard goods. Any variation can be noted in ordering, and we will revise our prices to suit.

Packed for Shipment; Price on Application.

PROSPECTOR'S OUTFIT

4602B The following list is intended for ordinary prospecting trips, and contains everything that a prospector, without a knowledge of chemistry, requires. Other articles, such as spirit lamp, alcohol, sieves, etc., might be added but can be dispensed with, and have been omitted on account of weight and bulk. The liquids are packed in individual wooden packages.

1 Prospector's Pick.
3 Oz. Nitric Acid, C. P.
6 Test Tubes.
1 Miner's Gold Washing Horn.
4 Oz. Sulphuric Acid, C. P.
1 Test Tube Clamp.
2 Candles.
1 Prospector's Mortar and Pestle.
3 Oz. Muriatic Acid, C. P.
3 Oz. Concentrated Ammonia.
1 Magnifying Glass.
1 Oz. Chloride Tin (Stannous).

Price, Complete Outfit, on Application.

PROSPECTOR'S OUTFIT, INCLUDING BLOW PIPE APPARATUS

4602C This is intended to fill the requirements of those desiring a prospector's outfit and portable blow pipe apparatus for making simple tests by this process Complete outfit (as below), Price on Application.

6 Test Tubes, 6 inch.
1 Blow Pipe, 10 inches.
1 Block Charcoal.
1 Test Tube Clamp.
1 Magnet, 5 inches.
¼ Lb. Lead Foil.
1 Prospector's Pick.
1 Pair Pliers, 5 inches.
¼ Lb Saltpetre.
1 Ivory Scale for Blow Pipe Beads.
6 Closed Glass Tubes, $\frac{3}{16}$ inch.
3 Open Glass Tubes, $\frac{3}{16}$ inch, Hard Glass.
2 Books Litmus Paper.
2 Books Turmeric Paper.
2 Sheets Brazil Wood Paper.
1 Oz. Microcosmic Salts.
¼ Lb. Potash Nitrate (Pure).
1 Oz. Cobalt Nitrate.
4 Oz. Nitric Acid, C. P.
4 Oz. Muriatic Acid, C. P.
1 Prospector's Mortar and Pestle.
1 Miner's Gold Washing Horn.
1 Magnifying Glass, Double Lens.
1 Alcohol Lamp, Brass.
1 Piece Platinum Wire.
1 Quart Wood Alcohol.
¼ Lb. Bicarbonate Soda.
1 Oz. Bisulphate Potash.
1 Oz. Chloride Tin (Stannous).
4 Oz. Concentrated Ammonia.
4 Oz. Sulphuric Acid, C. P.

COPPER ASSAY OUTFITS

No. 4603A

OUTFIT FOR COPPER DETERMINATION BY CYANIDE OF POTASSIUM METHOD

½ Lb. Asst'd Glass Rod and Tubing.
2 Burettes, 50 cc. 1-10 with Glass Cocks.
1 Burette Stand.
2 Funnel Stands.
6 Beakers, 20 ounce.
6 Beakers, 12 ounce.
6 Beakers, 8 oz.
1 Gallon Distilled Water.
1 Oz. Copper Foil, C. P.
1 Lb. Potassium Cyanide, 98-99%.
9 Lbs. Sulphuric Acid, Comm'l.
8 Lbs. Concentrated Ammonia, C. P.
7 Lbs. Nitric Acid, C. P.
7 Lbs. Nitric Acid, Comm'l.
6 Lbs. Hydrochloric Acid, Com'l.
1 Lb. Sulphuric Acid, C. P.
1 Wash Bottle, 16 oz.
2 Amber Colored Bottles, 5 pts.
6 Funnels, Bunsen, 3½ inch.
6 Pkgs. Filters, 7 in. Diam.
1 Analytical Balance, sensitive to 1-10 Mg., with Rider Attachment.
1 Set Weights, 50 Grams to 1 Mg., with Riders.
1 Kerosene Stove.
1 Graduate, 8 ounce.
1 Graduated Cylinder, 10 cc.
4 Pipettes, 10 cc.
6 Sand Baths.
1 Sampler and Scoop.
1 Agate Mortar and Pestle.
1 Iron Mortar and Pestle.
6 Casseroles, 4 inch Diameter.
2 Books Litmus Paper.
1 Box Blank Labels.
2 Pairs Pincers.
1 Buckboard and Muller.
2 Spatulas.
2 Sieves, 80 and 100 Mesh.
12 Copper Flasks, 16 oz.
1 Porcelain Color Plate.

Price, Complete Outfit, on Application.

OUTFIT FOR COPPER DETERMINATION BY POTASSIUM IODIDE METHOD

No. 4603B

3914
2 Burettes, 50 cc. in 1-10, Glass Stoppered.
1 Burette Stand.
2 Funnel Stands.
1 Lb. Sulphuric Acid, C. P.
½ Gal. Grain Alcohol.
7 Lbs. Nitric Acid, Com'l.
5 Lbs. Sodium Carbonate, Com'l.
6 Lbs. Hydrochloric Acid, Com'l.
5 Lbs. Hyposulphite Soda, Com'l.
1 Oz. Copper Foil.
2 Oz. Potassium Iodide, C. P.
1 Lb. Acetic Acid C. P.
½ Lb. Starch.
1 Buckboard and Muller.
1 Sampler and Scoop.
2 Books Litmus Paper.
1 Book Chemical Labels.
1 Box Blank Labels.
1 Wash Bottle, 16 oz.
1 Porcelain Color Plate.
1½ Gal. Iron. Mortar with Pestle.
1 Agate Mortar and Pestle.
1 Analytical Balance, Sensitive to 1-10 Mg., with Rider Attachment.
1 Set Weights, 50 Grams to 1 Mg., with Rider.
1 Alcohol Lamp, 8 oz.
1 Kerosene Stove.
2 Pincers.
3 Pinch-cocks.
1 Graduate, 8 oz.
1 Graduated Cylinder, 50 cc.
6 Pkgs. Filters, 7 inch Diam.
6 Beakers, 8 oz.
½ Lb. Asst'd Glass Rods and Tubing.
6 Feet Rubber Tubing.
6 Sand Baths.
2 Sieves, 80 and 100 Mesh.
6 Funnels, 3½ inch.
12 Copper Flasks, 16 oz.
2 Spatulas.
1 H_2S Apparatus.

Price, Complete Outfit on Application.
Any modification of the above lists can be made and we will quote accordingly.

ASSAY OUTFITS

No. 4604A

OUTFIT FOR THE ASSAY OF LEAD BY WET METHOD

6 Stirring Rods.
2 Books Litmus Paper.
6 Funnels, Bunsens, 3½ inch.
1 Pkg. Filter Paper, S. S. 18½ cm.
¼ Lb. Carbonate Soda, C. P.
1 Lb. Sulphuric Acid, C. P.
7 Lbs. Nitric Acid, C. P.
1 Lb. Acetic Acid, C. P.
1 Gal. Distilled Water.
1 Wash Bottle, 16 oz.
6 Porcelain Casseroles, 4 inch.
6 Porcelain Capsules.
1 Analytical Balance, sensitive to 1-10 Mg. with Rider Attachment.
1 Set Weights, 50 grams, to 1 Mg., with Riders.
1 Buckboard and Muller.
6 Beakers, 6 oz.
1 Sampler and Scoop.
2 Sieves, 80 and 100 Mesh.
I Kerosene Stove.

Price, Complete Outfit, on Application.

No. 4604B

OUTFIT FOR RETORTING AMALGAM

1 Bullion Mould.
1 Bullion Furnace.
1 Burner for same.
1 Blow Pipe outfit for same.
3 Black Lead Crucibles for same.
1 Pair Tongs for above.
1 Amalgam Strainer.
1 Black Lead Stirrer.
1 Quicksilver Dipper.
1 Quicksilver Kettle, Porc. Lined.
1 Amalgam Mortar.
2 Chamois Skins.
10 Lbs. Potassium Nitrate.
10 Lbs. Borax Glass.
10 Lbs. Soda Ash.
1 Lb. Reddle.
1 Bullion Balance.
1 Set Weights for same.
1 Condenser for same.
1 Iron Retort Plate.
1 Pair Asbestos Gloves.

Price, Complete Outfit, on Application.

Any modification of the above list can be made and we will quote accordingly.

MULE BACK TRANSPORTATION

If goods are to be packed for mule back, kindly so specify in ordering.

CHEMICAL APPARATUS AND CHEMICALS IN SETS

No. 4605A

CHEMICAL SET No. 1

Compiled especially for use in modern schools. Additions can be made if desired, and prices vary accordingly.

2 oz. Acid, Acetic.
1 lb. Acid, Hydrochloric.
1 lb. Acid, Nitric.
2 lbs. Acid Sulphuric.
1 oz. Acid, Oxalic.
½ oz. Acid Tartaric.
2 oz. Ammonium Chloride.
4 oz. Ammonium Hydrate.
1 oz. Ammonium Nitrate.
1 oz. Ammonium Sulphide.
1 oz. Animal Charcoal.
½ oz. Antimony.
½ oz. Arsenic Trioxide.
1 oz. Alum.
8 oz. Alcohol Methyl.
1 oz. Barium Chloride.
1 oz. Barium Nitrate.
2 oz. Calcium Carbonate.
2 oz. Calcium Fluoride.
4 oz. Calcium Sulphate.
1 oz. Carbon Bisulphide.
1 oz. Charcoal.
2 oz. Copper Sulphate.
1 Test Tube.
1 Test Tube Brush.
1 Test Tube Holder.
1 Glass Retort, 4 oz.
1 Lead Dish.
1 Pipette.
Rubber Tubing.
1 Evaporation Dish, 2 oz.
1 Deflagration Spoon.
1 1-qt. Specie Tar for Deflg.
1 Blow Pipe.
1 Spirit Lamp, 4 oz.
2 oz. Ether.
1 oz. Ferrous Sulphide.
2 oz. Ferrous Sulphate.
½ oz. Gall Nuts Powdered.
1 oz. Gun Cotton.
2 oz. Galena.
1 oz. Lead Acetate.
¼ oz. Lead Carbonate.
2 drs. Litmus.
2 oz. Mercury.
6 in. Magnesium Ribbon.
2 oz. Magnesium Sulphate.
1 lb. Manganese Dioxide.
1 ft. Platinum Wire.
2 drs. Phosphorus.
1 oz. Potassium Bichromate.
2 oz. Potassium Chlorate.
2 oz. Potassium Ferrocyanide.
1 oz. Potassium Hydrate.
1 oz. Potassium Nitrate.
1 oz. Strontium Chloride.
1 oz. Strontium Nitrate.
4 oz. Sulphur.
1 oz. Silver Nitrate.
1 oz. Sodium Biborate.
1 oz. Sodium Carbonate.
1 oz. Sodium Sulphate.
4 oz. Zinc for making Hydrogen.
1 Glass Funnel, 2 oz.
1 Graduate, 50 cc.
¼ lb. Chem. Glass Tubing, ¼ in.
1 File, 4 inch.
Beakers (Nest of 3).
1 Flask, 8 oz., Florence.
1 Evolution Flask (for making Hydrogen, Carb. Acid Gas, etc)
Filtering Paper, 4 in. Diam.
Hession Crucibles (Nest of 4).
1 Sand Bath.
1 Wedgewood Mortar, 2¾ in.

Price on Application.

CHEMICAL SET No. 2
No. 4606A

¼ lb. Acid,, Acetic.
1 lb. Acid, Hydrochloric.
1 lb. Acid, Nitric.
1 oz. Acid, Oxalic.
2 lbs. Acid, Sulphuric.
1 oz. Acid, Tartaric.
1 oz. Ammonium Carbonate.
2 oz. Ammonium Chloride.
¼ lb. Ammonium Hydrate.
1 oz. Ammonium Nitrate.
1 oz. Ammonium Sulphide.
½ pt. Alcohol, Methyl.
2 oz Alum.
2 oz. Animal Charcoal.
½ oz. Antimony.
1 oz. Arsenious Anhydride.
1 oz. Barium Chloride.
1 oz. Barium Nitrate.
1 oz. Borax.
¼ lb. Calcium Carbonate.
2 oz. Calcium Chloride.
2 oz. Calcium Fluoride.
¼ lb. Calcium Sulphate.
1 oz. Carbon Bisulphide.
1 oz. Cobalt Nitrate.
4 oz. Copper Sulphate.
2 oz. Ether.
2 oz. Ferrous Sulphate.
1 oz. Ferrous Sulphide.
2 drs. Gall Nuts.
2 oz. Galena.
1 oz. Lead Acetate.
2 oz. Lead Carbonate.
2 oz. Lead Monoxide.
1 oz. Litmus (Best Cubes).
12 in. Magnesium Ribbon.
2 oz. Megnesium Sulphate.
1 lb. Manganese Dioxide.
2 oz. Mercury.
12 in. Platinum Wire.
½ oz. Phosphorous.
½ dr. Potassium (Metallic).
¼ lb. Potassium Bichromate.
2 oz. Potassium Carbonate.
½ lb. Potassium Chlorate.
1 oz. Potassium Chromate.
½ oz. Potassium Cyanide.
1 oz. Potassium Ferricyanide.
2 oz. Potassium Ferrocyanide.
1 oz. Potassium Hydrate.
1 oz. Potassium Iodide.
2 oz. Potassium Nitrate.
1 oz. Potassium Permanganate.
1 oz. Potassium Sulphate.
1 dr. Silver Nitrate.
1 dr. Sodium (Metallic).
½ oz. Sodium Acetate.
2 oz. Sodium Carbonate.
1 oz. Sodium Hydrate.
2 oz. Sodium Hyposulphite.
2 oz. Sodium Sulphate.
1 oz. Di-Sodium Photphate.
1 oz. Strontium Chloride.
1 oz. Strontium Nitrate.
¼ lb. Sulphur.
½ lb. Zinc for making Hydrogen

2 oz. Funnel. 8 oz. Funnel. Graduate, 50 cc.
Pipette. Retort, 4 oz. Glass. Retort Stand (iron rings)
12 Test Tubes. Test Tube Cleaner. Test Tube Holder.
5 Hessian Crucibles. Jeweler's Blow Pipe. Beakers (nest of 4).
Chemical Flask. Deflagration Spoon. Evaporating Dish.
File. Filtering Paper,4 in.diam. Wire Gauze, 4x4 in.
Spirit Lamp. Sand Bath. Rubber Tubing.
1 gal. Gas Bag and Stopcock. ½ lb. Assorted Glass Tubing.
Pneumatic Trough, 4x7x10 in. Lead Dish for Hydrofluoric Acid.
Specie Jars for Deflagration, 2 qt. Scales and Weights, Pockets, 6 in. Beam
Evolution Flask, fitted with Delivery Tube, complete, for making Hydrogen, Carbonic Acid Gas, etc. Wedgewood Mortar and Pestle, 3 in.

Price on Application

CHEMICAL SET No. 3

No. 4607A

1 lb. Acid, Acetic.
½ lb. Acid, Boracic.
2 oz. Acid, Citric.
2 lbs. Acid, Hydrochloric.
2 lbs. Acid, Nitric.
1 lb. Acid, Oxalic.
1 oz. Acid, Phosphoric.
4 lbs. Acid, Sulphuric.
½ lb. Acid, Tartaric.
1 qt. Alcohol, Methyl.
1 lb. Alum.
1 pt. Aqua Ammonia.
½ lb. Ammonium Carbonate.
1 lb. Ammonium Chloride.
1 oz. Ammonium Molybdate.
½ lb. Ammonium Nitrate.
1 oz. Ammonium Oxalate.
1 lb. Ammonium Sulphate.
2 oz. Ammonium Sulphide.
1 lb. Animal Charcoal.
1 oz. Antimony (Metallic).
2 oz. Antimony Sulphide.
½ oz. Arsenicum (Metallic).
¼ lb. Arsenious Anhydride.
1 oz. Asbestos.
2 oz. Barium Carbonate.
½ lb. Barium Chloride.
½ lb. Barium Nitrate.
1 lb. Barium Sulphate.
½ oz. Bismuth.
½ lb. Bone Ash.
½ lb. Calcium Carbonate.
1 lb. Calcium Chloride.
1 lb. Calcium Fluoride.
1 lb. Calcium Sulphate.
2 oz. Carbon Bisulphide.
½ lb. Charcoal.
2 oz. Cobalt Chloride.
2 oz. Cobalt Nitrate.
4 oz. Copper Turnings.
1 oz. Copper Nitrate.
1 lb. Copper Sulphate.
¼ Pint Ether.
2 oz. Ferric Chloride.
1 lb. Ferrours Sulphate.
¼ lb. Ferrous Sulphide.
1 oz. Gall Nuts.
1 oz. Indigo.
½ lb. Iron Fillings.
2 oz. Galena.
¼ ib. Lead Acetate.
1 lb. Lead Carbonate.
¼ lb. Lead Nitrate.
1 lb. Lead Protoxide.
1 oz. Litmus (Best Cubes).
2 oz. Logwood.
12 in. Magnesium Ribbon.
2 oz. Magnesium Chloride.
1 lb. Magnesium Sulphate.
2 lb. Manganese Dioxide.
1 oz. Mercuric Chloride.
4 oz. Mercury.
1 oz. Microcosmic Salt.
½ lb. Paraffine.
12 in. Platinum Wire.
1 Platinum Sponge.
1 oz. Phosphorous.
4 oz. Plumbago.
1 lb. Potassium Bichromate (red)
1 oz. Potassium Bitartrate.
½ lb. Potassium Carbonate.
1 lb. Potassium Chlorate.
2 lb. Potassium Chromate (yellow).
1 lb. Potassium Cyanide.
1 lb. Potassium Ferricyanide.
½ lb. Potassium Ferrocyanide.
2 oz. Potassium Hydrate (sticks)
1 oz. Potassium Iodide.
½ lb. Potassium Nitrate.
1 oz. Potassium Permanganate.
4 oz. Potassium Silicate.
½ lb. Potassium Sulphate.
2 drs. Potassium Sulphocyanide.
1 dr. Silver Nitrate.

Price on Application.

CHEMICAL SET No. 3—Continued

1 oz. Sodium Acetate.
½ lb. Sodium Biborate.
1 oz. Sodium Bromide.
1 lb. Sodium Bicarbonate.
2 lbs. Sodium Carbonate.
1 lb. Sodium Hydrate.
2 lbs. Sodium Hyposulphite.
1 lb. Sodium Nitrate.
¼ lb. Sodium Phosphate.
1 lb. Sodium Silicate.
1 lb. Sodium Sulphate.
½ lb. Strontium Carbonate.
¼ lb. Strontium Chloride.
½ lb. Strontium Nitrate.
2 oz. Di-Sodium Phosphate.
2 lbs. Sulphur.
¼ lb Tin (Metallic).
1 oz. Tin Protochloride.
1 pt. Turpentine.
1 lb. Zinc Carbonate.
¼ lb. Zinc Oxide.
1 lb. Zinc Sulphate.
1 lb. Zinc Mossy for Making Hydrogen.

Test Glass.
Test Tube Rack.
Test Tube Cleaner.
Test Tube Holder.
4 in. Wedgewood Mortar and Pestle.
1 gal. Gas Bag, Brass Stop-cock.
Lead Dish for Hydrofluoric Acid.
Iron Wire Gauze.
2 Safety Tubes, Thistle Top.
Hydrometer for Specific Gravity.
1 Jar for Hydrometer.
Pipette.
Watch Spring for Burning in Oxygen.
Pneumatic Trough, 4x7x10.
Sand Bath.
2 Specie Jars for Collecting. Gases and for Deflagration.
1 pt. Retort.
Receiver for Retort.
Iron Retort Stand.
Reduction Tube for Reading Metallic Oxide.
Set of 3 Brass Cork Borers.
Cork Screw.
1 Pair Crucible Tongs.
2 Nests (5) Hessian Crucibles.
Triangular File.
Round File.
Alcohol Lamp.
Nest of 3 Beakers, 3 to 16 oz.
1 pt. Glass Funnel.
1 4-oz. Glass Funnel.
1 pkg. of 100 Cut Filters.
Metric Graduate Glass, 100 cc.
1 Set (24) Reagent Bottles.
Woulff Bottles, 3 Necks, 1 pt.
Brass Deflagrating Spoon.
1 lb. Assorted Glass Tubing.
2 doz. Assorted Test Tubes.
2 doz. Assorted Corks.
Evolution Flask with Funnel and Delivery Tubes for Making Hydrogen, etc.
Chemical Thermometer.
Balance and Weights.
Brass Blow Pipe.
Rubber Tubing for Gas Con.
Polished Steel Spatula.
3 Glass Stirring Rods.
1 2-oz. Evaporating Dish.
1 6-oz. Exaporating Dish.
1 pt. Chemical Flask.
2 4-oz. Chemical Flasks.

Price on application.

MINERALOGICAL COLLECTIONS

MINERALS AND HOW TO STUDY THEM

4609A In order to meet the demand for suitable material illustrative of this work of Prof. E. S. Dana, we have compiled the collection listed below. The individual specimens are thoroughly typical and carefully selected for their effectiveness in enabling the student to obtain as practical a grasp of the subject as possible.

LIST OF SPECIMENS

1. Graphite.
2. Sulphur, Native.
*3. Orpiment.
*4. Stribnite.
5. Molybdenite.
*6. Silver, Native.
*7. Gold, Native.
*8. Pyrargyrite.
9. Cinnabar.
*10. Copper, Native.
*11. Chalcocite.
*12. Bornite.
13. Chalcopyrite.
*14. Tetrahedrite.
*15. Cuprite.
16. Malachite.
17. Azurite.
18. Galena.
*19. Pyromorphite.
*20. Vanadinite.
21. Cerussite.
*22. Wulfenite.
23. Cassiterite.
24. Rutile.
25. Pyrrhotite.
26. Pyrite.
*27. Marcasite.
*28. Arsenopyrite.
29. Hematite.
30. Magnetite.
*31. Magnetite Lodestone.
32. Chromite.
33. Limonite.
34. Siderite.
*35. Columbite.
36. Wolframite.
37. Millerite.
*38. Niccolite.
39. Garnierite.
40. Cobaltite.
*41. Pyrolusite.
42. Rhodonite.
*43. Rhodochrosite.
44. Sphalerite.
*45. Zincite.
*46. Willemite.
*47. Smithsonite.
48. Corundum.
*49. Bauxite.
50. Cryolite.
51. Fluorite.
*52. Wavellite.
53. Calcite, Xlized.
*54. Calcite, Cleavage.
*55. Calcite, Marble.
*56. Calcite, Mex. Onyx.
57. Calcite, Chalk.
58. Calcite, Calctufa.
59. Aragonite.
60. Apatite.
61. Anhydrite.
62. Gypsum.
63. Gypsum Selentie.
*64. Gypsum Satin Spar.
65. Dolomite.
66. Barite.
*67. Witherite.
68. Celestite.
*69. Strontianite.
70. Halite.
71. Quartz, Rock Crystal.
*72. Quartz, Milky xl.
73. Quartz, Rose.
74. Quartz, Smoky.
75. Quartz, Agate.
*76. Quartz, Chalcedony.
*77. Quartz, Heliotrope.
*78. Quartz, Jasper.
79. Quartz, Flint.
*80. Quartz, Silicified Wood.
81. Opal.
*82. Opal, Gepserite.
83. Opal, Wood Opal.
*84. Orthoclase, xl.
85. Orthoclase Cleavage.
86. Albite.
87. Oligoclase.
*88. Labradorite.
89. Pyroxene.
90. Pyroxene, Malacolite.
91. Spodumene.
92. Amphibole, Tremolite.
93. Amphibole, Actinolite.
*94. Amphibole, Asbestos.
95. Ambhibole, Hornblende.
96. Beryl.
97. Garnet.
98. Muscovite.
99. Biotite.
100. Lepidolite.
*101. Clinochlore.
102. Chrysolite.
*103. Zircon.
104. Scapolite.
*05. Vesuvianite.
106. Epidote.
*107. Zoisite.
108. Tourmaline.
109. Tourmaline, Rubellite.
*110. Topaz.
111. Titanite.
112. Andalusite.
113. Cyanite.
114. Staurolite.
115. Talc.
116. Serpentine.
*117. Datolite.
*118. Prehnite.
119. Apophyllite.
*120. Pectolite.
121. Thomsonite.
*122. Analcite.
123. Chabazite.
124. Stilbite.
*125. Huelandite.

Having planned two collections, one comprising the entire list of 125 specimens enumerated above, and the other of 75 specimens from it (omitting the starred names). Prices on application.

Size	75 Specimens	125 Specimens
2x2 inches	.....	.....
3x3 "	.....	.....

SUMMARY OF MINERAL COLLECTIONS

The following summary is intended to list the different mineral collections which we offer for sale. It does not cover all of the collections which we prepare; but should enable the purchaser to determine more readily what collection is best suited to his (or her) needs than would be possible without hunting through our numerous catalogues in which most of the collections are described in detail.

Any form cf mounting that is desired can be used with any of the collection; and the price will vary accordingly. If the method described is not suitable we will submit estimates for any other preferred. We recommend our improved tray for collections kept in table cases or drawers; as being cheaper than wooden blocks, and at the same time being a very neat method of display, the label always being in sight without the necessity of removing the specimen.

SYSTEMATIC COLLECTIONS

4610A Beginners' Collections: 36 spec. averaging 1½ in. x 1 in. wooden case. ....
Beginners' Collections: 36 spec. averaging 1½ in. x 1 in. polished case..... ....
Beginners' Collections: 36 spec. averaging 1½ in. x 2 in. wooden case..... ....
Beginners' Collections: 36 spec. averaging 1½ in. x 2 in. polished case..... ....
Beginners' Collections: 72 spec. averaging ¾ in. x 1½ in. wooden case.... ....
Beginners' Collections: 72 spec. averaging ¾ in. x 1½ in. polished case.... ....
Beginners' Collections: 100 spec. averaging 1 in. x 1½ in. in trays..... ....
Dana Collection: 75 spec. averaging 2 in. x 2 in. in plain trays..... ....
Dana Collection: 125 spec. averaging 2 in. x 1½ in. in plain trays..... ....
Dana Collection: 125 spec. averaging 2 in. x 2 in. in plain trays..... ....
Dana Collection: 75 spec. averaging 3 in. x 3 in. in plain trays..... ....
Dana Collection: 125 spec. averaging 3 in. x 3 in in plain trays..... ....
Students' Coll. 50 spec. averaging 2¾ in. x 1¾ in. compartment wooden trays and neat cloth board case..... ....
Students' Coll. 50 spec. averaging 2¾ in. x 1¾ in. compartment wooden trays and neat cloth board case..... ....
Students' Coll. 100 spec. averaging 2¾ in. x 1¾ in. compartment wooden trays and neat cloth board case..... ....
School Collection: 110 spec. averaging 3¼ in. x 2¼ in. walnut blocks or im proved trays..... ....
Normal School Collection: 120 spec. averaging 4 in. x 2¾ in. in plain troys.. ....
Normal School Collection: 150 spec. averaging 3½ in. x 2½ in walnut blocks or improved trays..... ....
Academy Collection: 180 spec. averaging 4 in. x 2¾ in. in plain trays..... ....
Academy Collection: 225 spec. aevraging 3¾ in. x 2¾ in. walnut blocks or improved trays..... ....
Academy Collection: 275 spec. averaging 3½ in. x 2½ in. walnut blocks..... ....
College Collection: 350 spec. averaging 3¾ in. x 2½ in. on blocks..... ....
College Collection: 360 spec. averaging 4 in. x 2¾ in. in plain trays..... ....
College Collection: 390 spec. averaging 3½ in. x 2½ in. mtd. on blocks..... ....
University Collection: 600 spec. averaging 4 in.x 2¾ in. drawer cabinet..... ....
University Collection: 600 spec. selected quality; with collection of 50 crystal models; mounted on blocks..... ....
Complete Type Coll. 1,000 spec. averaging 4 in. x 3 in. drawer cabinet or ....

BLOW PIPE COLLECTIONS

4610B 25 spec. small size compartment case..... ....
50 spec. small size compartment case..... ....
100 spec. ¾ in. x ¾ in. pol. compartment case..... ....
200 spec. ¾ in. x ¾ in. pol. compartment case..... ....
100 spec. 2 in. x 2¾ in. trays, (100 analyses)..... ....
100 spec. 4 in. x 2¾ in. trays, (200 to 300 analyses)..... ....
50 spec. fragments in wooden boxes averaging 10 to 15 analyses..... ....
50 to 200 spec. fragments in wooden boxes averaging 35 to 45 analyses.... ....

PRICES ON APPLICATION

MINERALS BY THE POUND

All the minerals listed below are in pieces of large size, suitable for breaking up for student's use, and are of first class quality only. Blow pipe material is listed on a separate page.

Owing to the fluxuation of the market at this time, we are unable to give prices but all orders will be filled at the lowest market prices.

	Per lb.
Agate	....
Albertite	....
Albite, Cleavelandite	....
Allanite	....
Alunite	....
Amphibole	....
Anhydrite	....
Anthophyllite	....
Anthracite	....
Apatite	....
Arsenopyrite	....
Asphaltum	....
Barite	....
Bauxite	....
Beryl	....
Biotite	....
Bog Iron	....
Bornite	....
Bronzite	....
Calcite	....
Calcite, Blue	....
Calcite, Chalk	....
Calcite, Cleavable	....
Calcite, Iceland Spar	....
Calcite, Limestone	....
Calcite, Marble	....
Cassiterite	....
Celestite	....
Cerite	....
Chalcedony	....
Chalcopyrite	....
Chalk	....
Chert	....
Chonodrite in Calcite	....
Chromite	....
Chrysocolla	....

	Per lb.
Chrysolite	....
Cinnabar	....
Cleavelandite	....
Columbite	....
Coquina	....
Corundum	....
Cryolite	....
Dolomite	....
Dufrenite	....
Emery	....
Enargite	....
Enstatite	....
Epidote	....
Flexible Sandstone	....
Flint	....
Fluorite	....
Fowlerite	....
Galenite	....
Garnet	....
Garnierite	....
Glauconite	....
Graphite	....
Griphite	....
Gypsum	....
Gypsum, Satin Spar	....
Gypsum, Selenite, N. Y.	....
Gypsum, Selenite, Utah	....
Halite	....
Hanksite	....
Heliotrope	
Hematite	....
Hematite Kidney Ore	....
Hornblende	....

MINERALS BY THE POUND—Concluded

	Per lb.
Iceland Spar	....
Iolite	....
Iron, Meteoric (shavings) per ounce	....
Jade	....
Jasper	....
Kaolinite	....
Kidney Ore	....
Labradorite, N. Y.	....
Labradorite, Labrador	....
Lapis Lazuli	....
Lepidolite	....
Limestone	....
Limonite	....
Lodestone	....
Lodestone (strong)	....
Lodestone (extra)	....
Magnesite	....
Magnetite	....
Magnetite, Lodestone	....
Manganite	....
Marble	....
Marekanite	....
Marcasite	....
Marmolite	....
Menaccanite	....
Meteoric Iron (shavings) per ounce	....
Mexican Onyx	....
Molybdenite in rock	....
Muscovite	....
Native Coke	....
Natron	....
Obsidian	....
Ocher	....
Opal, Semi-Opal	....
Opalized Wood	....
Orthoclase	....
Perthite	....
Phlogopite	....
Phosphate Nodules	....
Prochlorite	....
Psilomelane	....
Pyrite	....
Pyrolusite	....
Pyrrhotite	....
Quartz, Chalcedony	....
Quartz, Flexible Sandstone	....
Quartz, Flint	....
Quartz, Heliotrope	....
Quartz, Jasper	....
Quartz, Milky	....
Quartz, Rose, deep color	....
Quartz, Rose, light color	....
Quartz, Smoky	....
Rhodochrosite	....
Rhodonite	....
Rose Garnet in rock	....
Rubellite in Lepidolite	....
Rutile	....
Satin Spar	....
Selenite, N. Y.	....
Selenite, Utah	....
Serpentine	....
Siderite	....
Soda Niter	....
Sphalerite	....
Spodumene	....
Stibnite	....
Tachydrite	....
Talc	....
Thulite	....
Titanite	....
Topaz	....
Tourmalin, Crystallized, in Matrix	....
Tourmalin, Massive	....
Tremolite	....
Turgite	....
Uintahite	....
Wernerite	....
Willemite	....
Witherite	....
Wolframite	....
Wurtzite	....
Zoisite, Thulite	....

Prices are all F. O. B. Rochester, N. Y.

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AUTHOR—NAME

The following list of scientific books has been carefully selected as embodying the very best in this line for the assayer, metallurgist, engineer, mining man, etc., as also for the student or any one who may be interested in the mineral industry. A great many of the books we carry in stock, and can always obtain any publication desired which may not be found in this list. All books are sold net, postpaid. We always supply latest edition unless otherwise specified. Prices on application.

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WE MAKE A SPECIALTY OF HEAVY CHEMICALS AND ARE LARGE DISTRIBUTORS OF

Potassium Cyanide. (Roessler & Hasslacher).

Sodium Cyanide. (Roessler & Hasslacher).

Zinc Shavings (cut fresh to order, medium and fine, from zinc of Highest purity).

Lead Acetate (all grades).

Litharge, C. P. (American Smelting & Refining Company's).

Litharge Commercial.

Mercury.

Caustic Soda.

Soda Ash.

Soda Bicarbonate.

Sal Soda.

Borax, powder and crystal.

Borax Glass.

Sal Ammoniac, granular and lump.

Manganese Dioxide.

Calcium Carbide, etc.

Merck's, Baker and Adamson's, and J. T. Baker's and Mallinchrodt's chemicals carried in stock.

ACID PACKAGES

Commercial acids are shipped in the following packages:

Sulphuric 66° Be.	Tank Cars, Drums and Carboys
Nitric Acid, Commercial	Carboys
Muriatic Acid, Commercial	Wooden Tank Cars, Carboys
Mixed Acids or Power Acids	Tank Cars, Drums and Carboys
Ammonia	Tank Cars, Drums and Carboys

All chemically pure and commercial acids and ammonia are shipped in glass. 5-pint bottles, 1-lb. bottles and carboys.

5-Pint Bottle of C. P. Sulphuric Acid contains 9 lbs.
5-Pint Bottle of C. P. Nitric Acid contains 7 lbs.
5-Pint Bottle of C. P. Hydrochloric Acid contains 6 lbs.
5-Pint Bottle of C. P. Ammonia contains 4½ lbs.

All 5-pint bottles are packed neatly and securely in a barrel, 16 bottles to the barrel, weighing as follows:

	Net Weight of Contents	Approx. Shipping Weight
Sulphuric Acid	144 lbs.	220 lbs.
Nitric Acid	112 lbs.	190 lbs.
Hydrochloric Acid	96 lbs.	175 lbs.
Ammonia	72 lbs.	150 lbs.

Carboys as follows:

Sulphuric Acid, C. P.	200 lbs.	260 lbs.
Nitric Acid, C. P.	155 lbs.	215 lbs.
Hydrochloric Acid, C. P.	125 lbs.	185 lbs.
Ammonia, C. P.	100 lbs.	160 lbs.

Commercial acids and ammonia in carboys weigh approximately the same as C. P. acids.

Sulphuric acid 66° Be. is shipped in tank cars of a capacity of 30,000 to 65,000 pounds.

Sulphuric acid 60° Be. shipped in tank cars with a capacity of 60,000 pounds.

Sulphuric acid 66° Be. shipped in drums weighing 1,600 lbs. net.

Carboys are charged at $5.00 each, acid drums at $25.00 each, aqua ammonia drums at $25.00 each, all returnable at the same price (if in good condition), less freight to Denver or Salt Lake City.

Carboys not bearing our brand are returnable at $1.00 each, provided both carboy and box are in good condition when received.

CHEMICALS AND REAGENTS

No. 4647A

Owing to the fluctuations of the market on chemicals it is impossible for us to list prices at this time. We will be pleased to receive your inquiries, and quotations which will have our prompt and careful attention.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Acetaldehyde—see Aldehyde Ethylic	$	$
Acetamide—$CH_3.CO.NH_2$		.90
Acetanilide—$C_6H_5NH.(CO.CH_3)$	1.85	.40
Acetone pure	.90	
Acetone c. p.—$CH_3CO.CH_3$	2.00	
Acetone Sulfite— $(CH_3)_2C(OH).SO_3Na$		
Acetonitrile—$CH_3.CN$		
Acetotoluid-o—$CH_3CONCH_6H_4.CH_3$		
Acetotoluid-p—$CH_3CONCH_6H_4CH_3$		
Acetphenetidin U.S.P.—$C_{10}H_{13}NO_2$	6.00	.90
Acetyl Chloride—$CH_3.CO.CL$		1.25
Acetyl Oxide—see (Acid) Acectic Anhydride		
Acid Acetic 36% U.S.P.	.50	
Acid Acetic 50% c.p.	1.00	.20
Acid Acetic 80% c.p.	1.15	.25
Acid Acetic 99.5% glacial c.p.— $CH_3.COOH$	1.25	.25
Acid Acetic 99.7-9% c.p. Special	1.45	.30
(Acid) Acetic, anhydride c.p.— $(CH_3.CO2_2O$	.75	4.75
Acid Acetylsalicylic (Aspirin)— $C_6H_4.O.COCH_3.COOH$	4.25	.65
Acid Amino-acetic—see Glycocoll		
Acid Anilinesulfonic— see Acid Sulfanilic		
Acid Arsenic c.p.—H_3AsO_4	1.25	.25
Acid Arsenous lump or powd. techn.	.75	
Acid Arsenous powd. c.p.—As_2O_3	1.00	.20
Acid Benzaminoacetic— see Acid Hippuric		
Acid Benzilic—$(C_6H_5)_2C(OH)CO_3H$		
Acid Benzoic from **Resin**—$C_6H_5CO_2H$	$	$ 1.80
Acid Benzoic free from chlorine— $C_6H_5CO_2H$	5.75	.85
Acid Benzoic from **Toluene**	7.25	1.10
Acid Boric cryst. c.p.—H_3BO_3	.70	
Acid Boric powd. c.p.	.75	
Acid Boric cryst. or powd. U.S.P.	.50	
(Acid) Boric Anhydride (fused) c.p.	2.50	.50
Acid Borobenzoic— $C_6H_4COOH.B(OH)_2$		
Acid Bromic 1.12—$HBrO_3$		
Acid Bromobenzoic-o.—$BrC_6H_4.CO_2H$		
Acid Bromobenzoic-p.—$BrC_6H_4CO_2H$		
Acid Butyric 60%		
Acid Butyric 80%—$CH_3(CH_2)_2COOH$		
Acid Butyric Technical absolute— $CH_3(CH_2)_2CO_2H$	4.80	.70
Acid Butyric-N (Synth)— $CH_3(CH_2)_2CO_2H$		
Acid Camphoric medic U.S.P.— $C_{10}H_{16}O_4$	7.80	1.20
Acid Caproic-N Synth)— $CH_3(CH_2)_4CO_2H$		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Acid Carbolic U.S.P. Liquid 87%		1.00	.20	
Acid Carbolic white cryst. U.S.P.—C_6H_5OH		1.65	.35	
Acid Carbolic white loose cryst. C.P.		1.80	.35	
Acid Carbonic (liquified)—CO_2			.40	In 20 lb. cylinder. Cylinder extra $30
Acid Chloric (30%)—$HClO_3$				
Acid Chlorobenzoic-o—$ClC_6H_4.CO_2H$				
Acid Chlorobenzoic-p				
Acid Chlorplatinic see Platin. Chloride				
Acid Chromic technic		1.80	.35	
Acid Chromic pure		3.05	.45	
Acid Chromic c.p.—CrO_3		4.10	.60	
Acid Chrysophanic medic. U.S.P.—$C_{14}H_5(OH)_2(CH_3)O_2$			1.00	
Acid Cinnamic (Cinnamylic)—$C_6H_5.CH=CH.COOH$			2.00	
Acid Citric cryst. U.S.P.		1.85	.35	
Acid Citric powd. U.S.P.		1.85	.35	
Acid Citric cryst. c.p—$C_3H_4(OH)COOH)_3+H_2O$		2.20	.45	
Acid Citric powd. c.p.		2.40	.50	
Acid Cresylic see Cresol				
Acid Dichloracetic—$C_2H_2Cl_2O_2$				
Acid Formic 1.06 abt. 25% pure—HCOOH		.95		
Acid Formic 1.20 abt. 75% pure				
Acid Formic 1.20 abt. 85% c.p.				
Acid Gallic cryst. U.S.P.—$C_6H_2(OH)_3COOH+H_2O$		3.25	.50	
Acid Hippuric—$C_6H_5CO(NH.CH_2COOH)$				
Acid Hydriodic 1.5, c.p—HJ			.90	
Acid Hydriodic 1.7			.65	
Acid Hydriodic diluted 10%		1.25	.25	
Acid Hydrobromic diluted 10%—HBr		.75		
Acid Hydrobromic conc. 34%		1.75	.35	
Acid Hydrochloric 20° com'l 6 lb bottle		.08		Bottle, .50
Acid Hydrochloric 20° com'l 120 lb carboy		.06		Carboy, 5.00
Acid Hydrochloric 1.20 c.p., 1 lb bottles—HCl		.25		Bottle, .25
Acid Hydrochloric 1.20 c.p. 6 lb bottles		.20		Bottle, .50
Acid Hydrochloric 1.20 c.p. 10x6 lb bottles		.18		Bottles, .50 each. Case, 2.00
Acid Hydrochloric 1.20 c.p. 120 lb carboy		.16		Carboy, 5.00
Acid Hydrochloric 1.20 c.p. spec. As free		.30		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Acid Hydrocyanic diluted 2% U.S.P. —HCN		.65		
Acid Hydrofluoric 48% techn. in ceresin bottle		1.10		
Acid Hydrofluoric 48% techn. 10 lb lead jug		.50		Lead jugs extra.
Acid Hydrofluoric 48% techn. 80 lb lead jug		.45		
Lead and ceresin cont. not returnable.				
Acid Hydrofluoric c.p.—HF		1.70	.35	Ceresin bottle incl.
Acid Hydrofluorsilicic c.p—H_2SiF_6		2.70	.55	Ceresin bottle incl.
Acid Hypophosphorous 10% U.S.P.		1.25	.25	
Acid Hypophosphorous 30% U.S.P.		2.70	.55	
Acid Hypophosphorous 50% U.S.P— $HP(OH)_2$+Aq		4.15	.60	
Acid Iodic cryst.—HJO_3				
Acid Iodic Anhydride—J_2O_5				
Acid Iodopropionic-B— $CH_3.CHI.CO_2H$				
Acid Lactic 1.21 C.P.— $CH_3.CH(OH).COOH$		6.40	.95	
Acid Malic—$C_4H_6O_5$				
Acid Molybdic pure 85%—H_2MoO_4		6.00	.90	
(Acid) Molybdic Anhydride c.p. 100%—MoO_3		11.50	1.50	
Acid Monochloracetic cryst.— $CH_2ClCOOH$		4.40	.65	
Acid Muriatic see Acid Hydrochloric				
Acid Naphthionic—$C_{10}H_6(NH_2)SO_3H$	100grm.$3.75			
Acid Nitric 40° Be Com'l 7 lb bottle		.25		Bottle, .50
Acid Nitric 40° Be Com'l 140 lb carboy		.20		Carboy, 5.00
Acid Nitric 1.42 c.p. 1 lb bottles— HNO_3		.40		Bottle, .25
Acid Nitric 1.42 c.p. 7 lb bottle		.35		Bottles, .50
Acid Nitric 1.42 c.p. 10x7 lb bottle				Bottles, .50 each. Case, 2.00
Acid Nitric 1.42 c.p. 140 lb carboy		.25		Carboy, 5.00
Acid Nitric fuming 1.52 pure		.40		
Acid Nitric red fuming 1.60 c.p.		1.10		
Acid Nitric red fuming 1.60 pure		.45		
Acid Nitrobenzoic-O—$NO_2.C_6H_4.CO_2H$			5.95	
Acid Nitrobenzoic Para				
Acid Nitrohydrochloric U.S.P.— HNO_3+3HCl		.60		
Acid Nitrohydrochloric diluted U.S.P.		.35		
Acid Nitrosonitric see Acid Nitric fuming				
Acid Nitroxanthic see Acid Picric				
Acid Nucleinic from Yeast— $C_{40}H_{54}N_{14}O_{27}P_4$		1.75	.35	
Acid Oleic pure—$C_{18}H_{34}O_2$		.55		
Acid Orthoboric see Acid Boric				

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Acid Orthooxybenzoic see Acid Salicylic				
(Acid) Osmic—OsO_4	1 gmr. $4.80			
Acid Oxalic cryst. techn.		1.05	.20	
Acid Oxalic cryst. c.p.—$(COOH)_2+2H_2O$		2.00	.40	
Acid Oxalic Anhyd. c.p.				
Acid Oxyphenic see Pyrocatechin				
Acid Palmitic techn.—$CH_3(CH_2)_{14}CO_2H[(OH)_2]$				
Acid Para-amidobenzolsulfonic see Acid sulfanilic				
Acid Para-anilinesulfonic see Acid sulfanilic				
Acid Pararosolic see Acid Rosolic				
Acid Perchloric 1.12 c.p—$HClO_4$			1.40	
Acid Perosmic see Acid Osmic				
Acid Phenylacetic—$C_6H_5CH_2CO_2H$				
Acid Phenylformic see Acid Benzoic				
Acid Phenylic see Acid Carbolic				
Acid Phosphomolybdic 10% sol—$H_3PO_4 12MoO_3$		2.30	.45	
Acid Phosphoric Ortho 10% U.S.P.		.45		
Acid Phosphoric Ortho 50% U.S.P.		.70		
Acid Phosphoric Ortho 85% c.p.—H_3PO_4		1.45	.30	
(Acid) Phosphoric Anhydride—P_2O_5		2.50	.50	
Acid Phosphorous 1.12 solut.—H_3PO_3		5.25	.80	
Acid Phosphotungstic cryst.—$P_2O_5 12WO_3 42H_2O$			2.80	
Acid Phosphotungstic 10% solution		2.40	.50	
(Acid) Phthalic—$o.C_6H_4(CO_2H)_2$		10.20	1.55	
Acid Picramic—$OH.C_6H_2(NO_2)_2NH_2$			1.80	
Acid Picric pure		2.55	.50	
Acid Picric c.p.—$C_6H_2OH.(NO_2)_3[1:2:4:6]$ 20% water: cannot be shipped dry		3.00	.55	
Acid Prussic 2% see Acid Hydrocyanic				
Acid Pyrocatechuic see Pyrocatechin				
Acid Pyrogallic resubl.—$C_6H_3(OH)_3[1:2:3]$		5.40	.80	
Acid Pyroligneous crude		.28		
Acid Pyroligneous purif		.40		
Acid Rosolic—$(C_6H_4OH)_2.C_6H_4CO$			1.60	
Acid Salicylic U.S.P.—$C_7H_6O_3$		1.80	.35	
Acid Salicylic from natural oil		8.75	1.30	
Acid Silicic fine pure		1.00	.20	
Acid Silicic c.p.—SiO_2		2.55	.50	
Acid Silicofluoric see Acid Hydrofluorsilicic				
Acid Silicotungstic c.p.—$4H_2O.SiO_2.12WO_3+22H_2O$			2.00	
Acid Stearic techn.		.70		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.	
Acid Stearic pure—$C_{17}H_{35}COOH$	1.35	.30	
Acid Stibic see Antimonic Oxide			
Acid Stibious see Antimonous Oxide			
Acid Succinic c.p.—$C_2H_4(COOH)_2$		3.20	
Acid Sulfanilic— $C_6H_4.SO_3H.NH_2[1:4]+2H_2O$	4.65	.70	
Acid Sulfocarbolic—$C_6H_6O_4S$		.40	
Acid Sulfosalicylic—$C_7H_6SO_6$			
Acid Sulfuric 66° Be com'l 9 lb bottle	.08		Bottle, .50
Acid Sulfuric 66° Be com'l 180 lb carboy	.06		Carboy, 5.00
	.25		1 lb. bottle, .25
Acid Sulfuric 1.84 c.p. 1 lb bottles— H_2SO_4	.20		9 lb. bottle, .50
Acid Sulfuric 1.84 c.p. 10x9 lb bottles	.18		Bottles, .50 each. Case, 2.00
Acid Sulfuric 1.84 c.p. 180 lb carboy	.16		Carboy, 5.00
Acid Sulfuric 1.84 spec. c.p. 9 lb bottle N. free	.25		Bottle, .50
Acid Sulfuric fuming 20% SO_3 techn.	.30		9 lb. bottle, .50
Acid Sulfuric fuming 15% SO_3 c.p.	.60		
Acid Sulfurous solut. 6% c.p.— H_2SO_3	.50		
Acid Tannic—$C_{14}H_{10}O_9$	3.25	.50	
Acid Tartaric cryst. or powd. U.S.P.	1.65	.35	
Acid Tartaric cryst. c.p.— $C_2H_2(OH)_2(COOH)_2$	2.30	.45	
Acid Tartaric powd. pure	1.80	.35	
Acid Thioacetic c.p.—$CH_3CO.SH$			
Acid Thymic see Thymol			
Acid Trichloracetic—CCl_3COOH		.80	
Acid Trinitro Benzoic 2, 4, 6			
Acid Tungstic—$H_2WO_4.WO_3$		1.00	
(Acid) Valerianic trihydrated— $C_5H_{10}O_2+Aq$		2.15	
Acid Valeric-N (Synth.)— $CH_5(CH_2)_3CO_2H$.			
Acid Wolframic see Acid Tungstic			
Aconitine Alkaloid cryst. Potent U.S.P.—$C_{34}H_{47}NO_{11}$			
Agar Agar white shreds	3.00	.45	
Agar Agar white powd	3.05	.45	
Agaricin			
Albumen from Blood	1.80	.35	
Albumen from Eggs, Scales	2.60	.50	
Albumen from Eggs, Sol. powder	2.65	.55	
Alcohol Allylic—$C_3H_5.OH$			
Alcohol Amylic (Fusel Oil)	2.40	.50	
Alcohol Amylic, c.p.—$C_5H_{12}O$	3.50	.55	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.	
Alcohol Butylic, normal—$C_4H_{10}O$			
Alcohol, Caprylic—$C_8H_{18}O$		2.00	
Alcohol Ethylic denatured	.30		Gal. 1.50
Alcohol Ethylic 95% U.S.P.	1.25	.25	Gal. 9.75
Alcohol Ethylic absolute—$C_2H_5.OH$	2.40	.50	Gal. 14.00
Alcohol Ethylic absolute, Special	2.55	.55	
Alcohol Methylic 95%	.35		Gal. 2.00
Alcohol Methylic Absl.—CH_3OH	1.00	.20	Gal. 6.50
Alcohol Wood see Alcohol Methylic			
Aldehyde see Aldehyde Ethylic			
Aldehyde Acetic see Aldehyde Ethylic			
Aldehyde Ethylic conc.—CH_3CHO	4.50	.70	
Aldehyde Formic see Formaldehyde			
Alizarine (Dihydroxy Anthraquinone) —$C_6H_4(CO)_2C_6H_2(OH)_2$		3.25	
Alizarine Blue, Braebe		3.05	
Alizarine Paste about 20%	3.25	.50	
Alizarine Sod. Mono-Sulfonate— $NaC_{14}H_5O_2(OH)_2SO_3+H_2O$		2.10	
Alloys:			
Babbitt's Metal	1.25	.25	
Devarda for reduction	2.50	.50	
Fusible Rose's	4.50	.70	
Fusible Woods'	4.50	.70	
Allyl Bromide—$CH_2:CH.CH_2Br.$			
Allyl Phenol-O			
Allylthiocyanate see Oil Mustard artif—C_4H_5SN			
Aloin U.S.P.—$C_{16}H_{16}O_7+3H_2O$	1.90	.40	
Alphanaphthol recryst.—$C_{10}H_7.OH$		.50	
Alphanaphthylamine see Naphthylamine A			
Alum see Alumin. Potass. sulfate			
Alum Ammonia see Alumin. Ammon. Sulfate			
Alum Chrome see Chrom. and Potass. Sulfate			
Alum Sodium see Alumin. and Sodium Sulfate			
Alumina see Aluminum Oxide			
Aluminum Metal bars—Al	1.65	.35	
Aluminum Metal foil	2.40	.50	
Aluminum Metal powd	2.50	.50	
Aluminum Metar finest powder	3.30	.50	
Aluminum Metal sheet	1.25		
Aluminum Metal sticks	2.00	.40	
Aluminum Metal turnings	2.55	.50	
Aluminum Metal wire	2.55	.50	
Aluminum Acetate c.p.— —$Al_2O(C_2H_3O_2)_4+4H_2O$	1.60	.30	
Aluminum Acetate solution 8%	.50		
Aluminum Acetotartrate— $Al.C_2H_3O_2.C_4H_4O_6.$	2.60	.50	
Aluminum Ammon Sulfate pure	.40		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Aluminum Ammon Sulfate c.p.— $Al_2(NH_4)_2(SO_4)_4+24H_2O$	.50	
Aluminum Borate c.p.— $2Al_2O_3.B_2O_3+3H_2O$	2.90	.60
Aluminum Chloride cryst. c.p.— $Al_2Cl_6+12H_2O$	1.10	.25
Aluminum Chloride pure crystals— Al_2Cl_6	.80	
Aluminum Chloride Anhydrous— Al_2Cl_6	1.45	.30
Aluminum Fluoride c.p.—Al_2F_6	2.15	.45
Aluminum Hydrate pure	1.00	.20
Aluminum Hydrate c.p.—$Al_2(OH)_6$	2.20	.45
Aluminum Nitrate cryst. c.p.— $Al_2(NO_3)_6+18H_2O$	1.10	.20
Aluminum Nitrate dry c.p.	1.55	.30
Aluminum Oxalate c.p.— $Al_2(C_2O_4)_3+H_2O$	2.05	.40
Aluminum Oxide pure	1.10	.25
Aluminum Oxide c.p. ignited—Al_2O_3	1.60	.30
Aluminum Palmitate pure— $Al_2(C_{16}H_{31}O_2)_6$	1.00	.20
Aluminum Phosphate c.p.— $Al_2(PO_4)_2$	2.05	.40
Aluminum Potass. Sulfate pure	.50	
Aluminum Potass. Sulfate cryst. c.p. —$Al_2K_2(SO_4)_4+24H_2O$	.55	
Aluminum Potass. Sulfate powd. c.p.	.70	
Aluminum Potass. Sulfate dry cryst. c.p.	1.00	.20
Aluminum Potass. Sulfate burnt alum—$Al_2K_2(SO_4)_4$	.55	
Aluminum Sodium Chloride cryst. c.p.—$Al_2Cl_6.2NaCl$	1.40	.30
Aluminum Sodium Chloride anhydr.	3.25	.50
Aluminum Sodium Fluoride c.p.— —$Al_2F_6.6NaF$	2.05	.40
Aluminum Sodium Sulfate cryst. c.p. —$Al_2Na_2(SO_4)_4+24H_2O$	1.00	.20
Aluminum Sodium Sulfate anhydrous c.p.	1.10	.25
Aluminum Sulfate techn.	.30	
Aluminum Sulfate cryst. c.p.— $Al_2(SO_4)_3+18H_2O$	.55	
Aluminum Sulfate anhydr. c.p.	.90	
Aluminum Sulfide—Al_2S_3	2.05	.40
Aluminum Sulfite c.p.—$Al_2(SO_3)_3$	1.35	.25
Aluminum Tartrate c.p.— $Al(C_4H_4O_6)_3$	3.25	.50
Alundum 46-60-90-120 mesh	.80	
Alundun cement	.30	
Amido Dimethylaniline Base-P		1.90
Amido Dimethylaniline HCl-P		1.50
Amido Phenol-O—$C_6H_4(OH)(NH_2.)$	8.10	1.20
Amido Phenol-P—$C_6H_4(OH)(NH_2.)$	5.70	.85

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Ammonia Alum see Alumin. Ammon. Sulfate				
Ammonium Acetate c.p. crystals—CH_3COONH_4		1.65	.35	
Ammonium Arsenate c.p.—$(NH_4)_2HAsO_4$		2.25	.45	
Ammonium Arsenite c.p.—NH_4AsO_2		2.25	.45	
Ammonium Benzoate—$NH_4C_7H_5O_2$		7.80	1.15	
Ammonium Bicarbonate c.p.—NH_4HCO_3		.95		
Ammonium Bichromate c.p.—$(NH_4)_2Cr_2O_7$		2.20	.45	
Ammonium Bifluoride c.p.—$NH_4F.HF$		2.15	.45	
Ammonium Binoxalate c.p.—$NH_4HC_2O_4+H_2O$		1.80	.35	
Ammonium Biphosphate c.p.—$NH_4H_2PO_4$		1.35	.25	
Ammonium Bisulfate c.p.—$NH_4.HSO_4$		.90		
Ammonium Bisulfite solut. c.p.		1.10	.20	
Ammonium Bitratrate c.p.—H_4O_6		2.70	.55	
Ammonium Borate c.p.—$(NH_4.HB_4O_7)+3H_2O$		2.15	.45	
Ammonium Bromide—NH_4Br		1.50	.30	
Ammonium Carbonate pure		.50		
Ammonium Carbonate powd. pure		.55		
Ammonium Carbonate c.p.—$(NH_4)_2CO_3.H_2O$		.65		
Ammonium Carbonate cubes		.70		
Ammonium Chloride lump (Sal Ammoniac)		.55		
Ammonium Chloride granul. techn.		.50		
Ammonium Chloride granul. pure		.55		
Ammonium Chloride c.p.—NH_4Cl		.80		
Ammonium Chloride c.p. special		1.10	.25	
Ammonium Chromate c.p.—$(NH_4)_2CrO_4$		3.30	.50	
Ammonium Chromium Sulfate c.p. crystals				
Ammonium Chromium Sulfate c.p. 30% Solution				
Ammonium Citrate c.p.—$(NH_4)_2C_6H_6O_7$				
Ammonium Fluoride c.p.—NH_4F	Wax bottle included	3.25	.50	
Ammonium Formate—NH_4CHO_2		3.65	.55	
Ammonium Hydrate .90 c.p. 1 lb bottles—NH_4OH		.35		Bottle, .25
Ammonium Hydrate .90 c.p. 4 lb bottles		.33		Bottle, .50
Ammonium Hydrate .90 c.p. 10x4 lb bottles		.32		Bottles, .50 each. Case, 2.00

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.	
Ammonium Hydrate .90 c.p. 90 lb carboy	.30		Carboy, 5.00
Ammonium Hydrosulfide—$(NH_4)HS$	.55		
Ammonium Hypophosphite—$NH_4PH_2O_2$	3.35	.50	
Ammonium Iodate c.p.—NH_4JO_3			
Ammonium Iodide c.p.—NH_4J		1.40	
Ammonium Molybdate c.p. crystals—$(NH_4)_6Mo_7O_{24}+4H_2O$	7.15	1.10	
Ammonium Molybdate c.p. solut.	2.15	.45	
Ammonium Muriate see Ammon. Chloride			
Ammonium Nitrate pure	.60		
Ammonium Nitrate fused pure	.70		
Ammonium Nitrate c.p.—NH_4NO_3	.90		
Ammonium Nitrate fused c.p.	1.20	.25	
Ammonium Nitrite liquid—NH_4NO_2	1.00	.20	
Ammonium Oxalate c.p.—$(NH_4)_2C_2O_4+H_2O$	2.55	.50	
Ammonium Oxalate c.p. special	3.25	.50	
Ammonium Persulfate c.p.—$(NH_4)_2S_2O_8$	2.00	.40	
Ammonium Phenolsulfonate—$C_6H_4OHSO_3.NH_4$		.35	
Ammonium Phosphate Dibasic—$(NH_4)_2HPO_4$	1.75	.35	
Ammonium Phosphate see c.p.—NH_4H_2	1.25	.25	
Ammonium Phosphate prim. c.p.—$(NH_4)PO_4$	1.45	.30	
Ammonium Phosphomolybdate c.p.—$2(NH_4)_3PO_4+24MoO_3+xH_2O$		2.45	
Ammonium Picrate c.p.—$NH_4C_6H_2(NO_2)_3O$	4.90	.75	
Ammonium Potass. Phosphate c.p.—KNH_4HPO_4	1.80	.35	
Ammonium Potassium Tartrate c.p.—$NH_4KC_4H_4O_6$	3.40	.50	
Ammonium Salicylate U.S.P.—$NH_4C_7H_5O_3$	2.90	.60	
Ammonium Silico Fluoride c.p.—$(NH_4)_2SiF_4$	2.45	.50	
Ammonium Sodium Phosphate see Sodium Ammonium Phosphate			
Ammonium Sulfate techn.	.45		
Ammonium Sulfate c.p.—$(NH_4)_2SO_4$	.55		
Ammonium Sulfate c.p. Special—$(NH_4)_2SO_4$	1.45	.30	
Ammonium Sulfide see Ammon. hydrosulfide			
Ammonium Sulfite cryst. c.p.—$(NH_4)_2SO_3+H_2O$	1.60	.30	
Ammonium Sulfocyanate pure			
Ammonium Sulfocyanate c.p.—$(NH_4)SCN$			
Ammonium Tartrate pure	1.60	.30	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Ammonium Tartrate c.p.— $(NH_4)_2C_4H_4O_6$	2.20	.45
Ammonium Tetroxalate c.p.— $NH_4HC_2O_4.H_2O$	2.20	.45
Ammonium Thiocyanate see Ammon. Sulfocyanate		
Ammnoium Vanadate—NH_4VO_3		
Ammonium Zinc Sulfate c.p.— $(NH_4)_2Zn(SO_4)_2$	1.65	.35
Amyl Acetate—$C_7H_{14}O_2$	1.30	.25
Amyl Butyrate—$C_9H_{18}O_2$	5.40	.70
Amyl Hydrate see Alcohol Amylic		
Amyl Hydride see Pentane		
Amyl Nitrate—$C_5H_{11}NO_3$		1.00
Amyl Nitrite—$C_5H_{11}NO_2$		.80
Amyl Valerate—$C_{10}0H_{20}O_2$		
Amylacetic Ether see Amylacetate		
Amylene—C_5H_{10}		
Amylene Hydrate		
Aniline pure	1.00	.20
Aniline c.p.—$C_6H_5NH_2$	1.55	.30
Aniline Acetate c.p.—$C_8H_{11}NO_2$	4.40	.65
Oniline Hydrochloride pure	3.05	.45
Aniline Hydrochloride c.p.— $C_6H_5NH_2.HCl$	2.05	.40
Aniline Nitrate—$C_6H_5NH_2.HNO_3$	4.50	.70
Aniline Oil see Aniline pure		
Aniline Oxalate c.p.— $(C_6H_5NH_2)_2.C_2H_2O_4$		.75
Aniline Salt see Aniline hydrochloride		
Aniline Sulfate—$(C_6H_5NH_2)_2.H_2SO_4$	3.25	.50
Aniline Dyes see Stains		
Anisol—$C_6H_5OCH_3$		
Anthracene Brown		2.00
Anthracene 82%—$C_6H_4:(CH)_2:C_6H_4$	5.30	.80
Anthraquinone 90%— $C_6H_4:(CO)_2:C_6H_4$		1.40
Anthraquinone Monosulphonate of Sodium		15.50
Antimony Metal lumps—Sb	.65	
Antimony Metal powd	.70	
Antimony Anhydride see Antimony (ic) Oxide		
Antimony (ic) Chloride Penta-c.p.— $SbCl_5$	2.65	.55
Antimony (ous) Chloride Tri- c.p.— $SbCl_3$	2.05	.40
Antimony Fluoride c.p.—SbF_3	3.00	.60
Antimony Hydroxide c.p.—$Sb(OH)_3$	2.55	.50
Antimony (ic) Oxide Penta- c.p.— Sb_2O_5	2.05	.40
Antimony (ous) Oxide Tri- c.p.— Sb_2O_3	2.30	.45
Antimony Oxychloride c.p.—SbOCl	2.30	.45

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Antimony Potass. Tartrate c.p.—$2C_4H_4O_6K(SbO)+H_2O$		3.05	.45	
Antimony Sulfate c.p.—$Sb_2(SO_4)_3$		1.80	.35	
Antimony (ous) **Sulfide Tri-** black pure—Sb_2S_3		3.05	.45	
Antimony Sulfide Tri- c.p. red—Sb_2S_3		3.05	.45	
Antimony (ic) **Sulfide Penta-** yellow c.p.—Sb_2S_5		2.05	.40	
Antimony Tartrate c.p.—$(SbO)_2C_4H_4O_6+H_2O$		2.55	.50	
Antipyrin (Dimethyloxyquinizone)—$C_{11}H_{12}N_2O$			2.80	
Apiol fluid green—$C_{12}H_{14}O_4$			1.00	
Aqua Ammonia see Ammon. Hydrate				
Aqua Fortis see Acid Nitric				
Aqua Regia see Acid Nitrohydrochloric				
Arbutin—$C_{12}H_{16}O_7$			2.30	
Arecoline Hydrobromide—$C_8H_{13}NO_2.HBr$	15 gr. 8.00			
Argols see Potass. Bitratrate				
Arrowroot see Starch				
Arsenic Metal lump—As				
Arsenic Metal powd				
Arsenic Bromide—$AsBr_3$			.80	
Arsenic Chloride—$AsCl_3$			.90	
Arsenic Iodide U.S.P.—AsJ_3			.90	
Arsenic Sulfide Penta- c.p.—As_2S_5		2.15	.45	
Arsenic Sulfide Tri- c.p.—As_2S_3		2.15	.45	
Arsenic (ous) **Oxide** see Acid Arsenious				
Arsenic (ic) **Oxide** see Acid Arsenic				
Arsenic White see Acid Arsenious				
Asbestos short fibre wooly washed in acid		3.85	.60	
Asbestos short fibre washed in acid		5.00	.75	
Asbestos long fibre washed in acid		6.75	1.00	
Asbestos washed in acid Special Gooch		5.30	.80	
Asbestos platinized 5%			10.00	
Asparagin—$C_2H_3(NH_2).(CO_2H)(CONH_2)+H_2O$				
Asphaltum Egyptian				
Aspirin see Acetylslicylic acid				
Atropine Alkaloid U.S.P.—$C_{17}H_{23}NO_3$	15 gr. 3.35			
Atropine Sulfate U.S.P.—$(C_{17}H_{23}NO_3)_2.H_2SO_4$	15 gr. 2.80			
Auripigment see Arsenic sulfide yellow				
Azobenzene (Azobenzol)—$C_6H_5.N_2.C_6H_5$				
Azolitmin (indicator)—$C_7H_7NO_4$				
Babbitt's Metal see Alloys				

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Balsam, Canada, in Xylol	20 c.c tube .45		.50	
Balsam Fir				
Balsam Peru				
Barium Acetate c.p.— $Ba(C_2H_3O_2)_2+H_2O$		.85		
Barium Borate c.p.—$BaB_2O_4+10H_2O$		1.45	.30	
Barium Bromate c.p.— $Ba(BrO_3)_2.H_2O$			1.30	
Barium Bromide c.p.—$BaBr_2+2H_2O$			1.20	
Barium Carbonate techn		1.00	.20	
Barium Carbonate c.p.—$BaCO_3$		1.25	.25	
Barium Chlorate c.p.— $Ba(ClO_3)_2+H_2O$				
Barium Chloride pure		.55		
Barium Chloride c.p.—$BaCl_2+2H_2O$		.60		
Barium Chloride anhydrous c.p.		.95		
Barium Chromate c.p.—$BaCrO_4$		1.35	.25	
Barium Citrate c.p.— $Ba_3(C_6H_5O_7)_2.7H_2O$		1.15	.25	
Barium Dioxide pure		1.00	.20	
Barium Dioxide c.p.—BaO_2		1.20	.25	
Barium Fluoride c.p.—BaF_2		1.65	.35	
Barium Hydroxide cryst. techn.		.35		
Barium Hydroxide cryst. pure		.60		
Barium Hydroxide cryst c.p.— $Ba(OH)_2+8H_2O$		.85		
Barium Hydroxide anhydr. c.p.		1.25	.25	
Barium Iodide—BaJ_2+2H_2O			1.00	
Barium Molybdate c.p.—$BaMoO_4$			1.15	
Barium Nitrate pure		.60		
Barium Nitrate c.p.—$Ba(NO_3)_2$		.85		
Barium Nitrate powder c.p.		.90		
Barium Oxalate c.p.—$BaC_2O_4+H_2O$		2.00	.40	
Barium Oxide pure—BaO		.95		
Barium Oxide c.p. hydrated—BaO		1.35	.25	
Barium Peroxide see Barium Dioxide				
Barium Phosphate c.p.—$BaHPO_4$		2.70	.55	
Barium Silicate c.p.—$BaSiO_3$		2.00	.40	
Barium Sulfate techn.		.30		
Barium Sulfate c.p. powder—$BaSO_4$		.65		
Barium Sulfide techn.		.65		
Barium Sulfide pure—BaS		1.35	.25	
Barium Sulfite c.p.—$BaSO_3$		1.45	.30	
Barium Tartrate c.p.—$BaC_4H_4O_6$		6.55	1.00	
Barium Thiosulfate (Barium hyposulfite)—$BaS_2O_3.H_2O$		1.90	.40	
Barium Tungstate—$BaWO_4$				
Barytes see Barium sulfate				
Bebeerine Hydrochloride— $C_{19}H_{21}NO_3.HCl$			3.20	
Bebeerine Sulfate— $(C_{19}H_{21}NO_3)_2.H_2SO_4$			3.20	
Beeswax see Wax				
Benzal Chloride—$C_6H_5.CHCl_2$		4.20	.65	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.	
Benzaldehyde (Oil bitter almonds artif.)—$C_6H_5.COH$	8.00	1.20	
Benzanilide—$C_6H_5.CONHC_6H_5$			
Benzenesulfonamide—$C_6H_5.SO_2WH_2$			
Benzenesulfonyl Chloride—$C_6H_5SO_2Cl$.			
Benzidine (Paradiaminodiphenyl) base			
Benzidine c.p.—$NH_2.(C_6H_4)_2.NH_2$			
Benzil—$C_6H_5CO.COC_6H_5$			
Benzin	.20		Gal., .75
Benzoin—$C_6H_5.CO.CH(OH).C_6H_5$.			
Benzol (Benzene) 90%	.35		Gal., 1.80
Benzel (Benzene) c.p.—C_6H_6	.65		
Benzophenone (Diphenyl Ketone)—$C_{13}H_{10}O$			
Benzoyl Bromide—C_6H_5COBr			
Benzoylchloride—$C_6H_5.CO.Cl$			
Benzoyl Hydride see Benzaldehyde			
Benzlyamine—$C_6H_5.CH_2NH_2$			
Benzyl Bromide—$C_6H_5.CH_2Br$.			
Benzyl Chloride—$C_6H_5CH_2Cl$	2.55	.50	
Benzyl Cyanide—$C_6H_5.CH_2CN$			
Betanaphthol—$C_{10}H_7.OH$	3.20	.50	
Bismuth Metal—Bi	5.95	.90	
Bismuth Metal powd.	6.10	.90	
Bismuth Acetate c.p.—$Bi(C_2H_3O_2)_3$	10.15	1.50	
Bismuth Arsenate c.p.—$Bi_3(AsO_4)_2$		1.30	
Bismuth Betanaphthol (Orphol)—$Bi_2O_2(OH).C_{10}H_7O$		1.05	
Bismuth Carbonate (Bis. Subcarbon.) c.p.—$(BiO)_2CO_3$			
Bismuth Chloride c.p.—$BiCl_3$	7.45	1.10	
Bismuth Citrate U.S.P.—$BiC_6H_5O_7$	6.90	1.05	
Bismuth Hydroxide c.p.—$Bi(OH)_3$	7.45	1.10	
Bismuth Iodide c.p.—BiJ_3		1.30	
Bismuth Lactate—$C_3H_4O_3.BiH.C_3H_4O_3$	8.20	1.25	
Bismuth Nitrate c.p.—$Bi(NO_3)_3+5H_2O$	5.55	.85	
Bismuth Oxide c.p.—Bi_2O_3	7.45	1.10	
Bismuth Oxide c.p. fused—Bi_2O_4	9.75	1.45	
Bismuth Oxide tetra- c.p.—Bi_2O_4	9.45	1.40	
Bismuth Oxychloride c.p.—BiOCl	7.20	1.10	
Bismuth Oxyiodide—BiOJ		1.00	
Bismuth Phosphate c.p.—$BiPO_4$		1.30	
Bismuth Phosphate soluble			
Bismuth Salicylate basic U.S.P.—$Bi(C_7H_5O_3)_3.Bi_2O_2$	6.20	.95	
Bismuth Subbenzoate—$Bi(C_7H_5O_2)_3.Bi(OH)_3$		.90	
Bismuth Subcarbonate U.S.P.—$(BiO)_2CO_3$	5.50	.85	
Bismuth Subgallate pure—$Bi(OH)_2C_7H_5O_5$	6.55	1.00	
Bismuth Subiodide see Bismuth Oxyiodide			

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Bismuth Subnitrate c.p.— $BiONO_3.H_2O$		7.20	1.10	
Bismuth Sulfate c.p.—$Bi_2(SO_4)_3$		7.45	1.15	
Sismuth Sulfide c.p.—Bi_2S_3			1.30	
Bismuth Tannate		4.90	.75	
Bismuth Valerianate— $Bi(C_5H_9O_2)_3.2Bi(OH)_3$			1.10	
Bismuth and Ammonium Citrate U.S.P.				
Bisol see Bismuth Phosphate soluble				
Black Lead see Graphite				
Bleaching Powder see Calc. hypochlorite				
Bone Ash		.30		
Borax see Sodium Borate				
Bromine—Br		3.00		½ lb. 1.65
Bromoacetanilide-p— $C_6H_4BrNH(C_2H_3O)$				
Bromoacetyl Bromide—$BrCH_2COBr$				
Bromoaniline-p—$BrC_6H_4NH_2$				
Bromoform—Br_3CH		6.00	.90	
Bromonaphthalene-a—$BrC_{10}H_7$				
Bromophenol-p—BrC_6H_4OH.				
Bromotoluene-o—$BrC_6H_4CH_3$				
Bromotoluene-p—$BrC_6H_4CH_3$				
Brucine—$C_{22}H_{26}N_2O_4+2H_2O$	⅛ oz. .65			
Brucine Sulfate— $(C_{22}H_{26}N_2O_4)_2.H_2SO_4+7H_2O$				
Butylaldehyde (normal) $CH_3CH_3CH_2CHO$				
Butyl Benzoate-N—$C_6H_5CO_2.C_4H_9$				
Butyl Bromide (normal)— $CH_3(CH_3)_2CH_2Br$				
Butyl-Chloralhydrate—$C_4H_7O_2Cl_3$				
Butyl Malonic Ester-N				
Cadmium Metal sticks—Cd		3.20	.50	
Cadmium Metal powd.		3.20	.50	
Cadmium Acetate c.p.— $Cd(C_2H_3O_2)_2+3H_2O$		3.85	.60	
Cadmium Bromide c.p.—$CdBr_2+{}_4H_2O$		4.70	.70	
Cadmium Carbonate c.p.—$CdCO_3$		3.90	.60	
Cadmium Chloride cryst. c.p.— $CdCl_2+2H_2O$		3.35	.50	
Cadmium Chloride anhydr. c.p.		4.60	.70	
Cadmium Fluoride c.p.—CdF_2		6.15	.90	
Cadmium Hydrate c.p.—$Cd(OH)_2$		5.80	.85	
Cadmium Iodide c.p.—CdJ_2		8.20	1.25	
Cadmium Nitrate c.p.— $Cd(NO_3)_2+4H_2O$		3.05	.45	
Cadmium Nitrate c.p. anhydrous		3.30	.50	
Cadmium Oxalate c.p.— $CdC_2O_4+3H_2O$		6.10	.90	
Cadmium Oxide c.p.—CdO		6.25	.95	
Cadmium Phosphate c.p.—$Cd_3(PO_4)_2$		6.25	.95	
Cadmium Sulfate c.p.— $3CdSO_4+8H_2O$		3.00	.45	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Cadmium Sulfate c.p. anhydrous	.90	
Cadmium Sulfide c.p.—CdS	4.25	.65
Caffeine pure—$C_8H_{10}N_4O_2+H_2O$		1.50
Caffeine Benzoate—$C_8H_{10}N_4O_2.C_7H_6O_2$		1.90
Caffeine Citrated—$C_8H_{10}N_4O_2C_6H_8O_7$		1.10
Caffeine Hydrobromide—$C_8H_{10}N_4O_2.HBr.2H_2O$		
Caffeine Hydrochloride—$C_8H_{10}N_4O_2.HCl+2H_2O$		
Caffeine Salicylate—$C_8H_{10}N_4O_2.C_7H_6O_3$		1.30
Caffeine Sodium Benzoate		
Caffeine Sodium Salicylate		1.25
Calcium Metal—Ca		2.40
Calcium Acetate grey pure	.45	
Calcium Aectate c.p.—$Ca(C_2H_3O_2)_2$	1.10	.20
Calcium Arsenate c.p.—$Ca_3(AsO_4)_2+Aq$	2.40	.50
Calcium Arsenite c.p.—$Ca_3(AsO_3)_2$	2.40	.50
Calcium Bichromate—$CaCr_2O_7$	1.75	.35
Calcium Biphosphate—$CaH_4(PO_4)_2+H_2O$		
Calcium Bisulfide c.p.	.70	
Calcium Bisulfite solut. c.p.	.60	
Calcium Borate c.p.—$Ca(BO_2)_2+2H_2O$	1.35	.30
Calcium Bromide c.p.—$CaBr_2$	3.25	.50
Calcium Carbide—CaC_2	.30	
Calcium Carbonate, precipitated chalk	.45	
Calcium Carbonate—Marble Chips	.20	
Calcium Carbonate c.p.—$CaCO_3$	.90	
Calcium Carbonate c.p. special	1.70	.35
Calcium Carbonate, Iceland Spar see Iceland Spar	4.65	.70
Calcium Chloride lump, com'l	.15	
Calcium Chloride for desiccators	.50	
Calcium Chloride cryst. c.p.—$CaCl_2+6H_2O$	.55	
Calcium Chloride pure anhydr. sticks—$CaCl_2$	.90	
Calcium Chloride anhydr. gran. c.p. for drying tubes 4-8-12-20 mesh	.80	
Calcium Chromate c.p.—$CaCrO_4+2H_2O$	2.05	.40
Calcium Citrate c.p.—$Ca_3(C_6H_5O_7)_4+4H_2O$	2.65	.55
Calcium Fluoride native powder	.30	
Calcium Fluoride c.p.—CaF_2	1.70	.35
Calcium Formate—$Ca(CHO_2)_2$	3.35	.50
Calcium Glycerophosphate	3.20	.50
Calcium Hydrate pure—$Ca(OH)_2$	.70	
Calcium Hypochlorite techn. (Bleaching Powder)	.25	
Calcium Hypochlorite c.p.—$Ca(ClO)_2+H_2O$	1.05	.20

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Calcium Hypophosphite U.S.P.— $Ca(PH_2O_2)_2$		1.85	.40	
Calcium Iodide c.p.—CaJ_2			1.15	
Calcium Lactate U.S.P.— $Ca(C_3H_5O_3)_2+5H_2O$		3.05	.45	
Calcium Lactophosphate cryst. soluble				
Calcium Lactophosphate powder soluble		4.80	.70	
Calcium Nitrate c.p.—$Ca(NO_3)_2$		1.20	.25	
Calcium Oxalate c.p.—CaC_2O_4		1.85	.35	
Calcium Oxide from Marble—CaO		.30		
Calcium Oxychlorite see Calc. Hypochlorite				
Calcium Permanganate— $Ca(MnO_4)_2+5H_2O$				
Calcium Peroxide—CaO_2+4H_2O		3.35	.50	
Calcium Phosphate crude, see Bone Ash				
Calcium Phosphate secondary c.p.— $CaHPO_4+H_2O$		1.00	.20	
Calcium Phosphate primary c.p.— $CaH_2PO_4+H_2O$		1.45	.30	
Calcium Phosphate tertiary c.p.— $Ca_3(PO)_4)_2$		1.35	.25	
Calcium Phosphide pure—Ca_3P_2		3.35	.50	
Calcium Potassium Ferrocyanide c.p. —$CaKFe(CN)_6 12H_2O$		3.35	.50	
Calcium Potassium Sulfate c.p.— $CaK_2(SO_4)_2.H_2O$.		1.25	.25	
Calcium Silicate pure—$CaSiO_3$		1.35	.25	
Calcium Silico Fluoride c.p.— $CaSiF_6+2H_2O$		2.65	.55	
Calcium Sulfate, crude (Gypsum)		.25		
Calcium Sulfate, (Gypsum) powder		.25		
Calcium Sulfate, calcinated (Plaster Paris)		.25		
Calcium Sulfate c.p.—$CaSO_4+2H_2O$		.65		
Calcium Sulfate anhydr. c.p.		1.10	.20	
Calcium Sulfide pure—CaS		.70		
Calcium Sulfide luminous		4.80	.75	
Calcium Sulfite c.p.—$CaSo_3$		.70		
Calcium Tartrate c.p.— $CaC_4H_4O_6+4H_2O$		2.70	.55	
Calomel see Mercury (ous) chloride				
Camphor—$C_{10}H_{16}O$				
Camphor Monobromated cryst— $C_{10}H_{15}BrO$		6.90	1.05	
Camphoric Anhydride see acid camphoric anhydride				
Canada Balsam see Balsam Fir				
Cannabine Tannate	15 gr., .80		5.75	
Carbamid (see Urea)—$Co(NH_2)_2$				
Carbon Dioxide see Acid Carbonic				
Carbon Disulfide		.45		
Carbon Disulfide c.p.—SC_2		.60		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.	
Carbon Tetrachloride	.60		
Carbon Tetrachloride c.p.—CCl_4	1.00	.20	
Carborundum cryst—SiC	.50		
Carborundum powd.	.70		
Carmine	8.90	1.35	
Carnauba Wax see Wax			
Casein tech.	.90		
Catechu			
Catechu powd			
Ceresin Black (Ozokerite)			
Ceresin White	1.10	.20	
Ceresin Yellow	.75		
Cerium Metal—Ce			
Cerium Chloride c.p.—$Ce_2Cl_6+14H_2O$			
Cerium Fluoride c.p.—CeF_4H_2O			
Cerium Nitrate—$Ce_2(NO_3)_6+12H_2O$	3.35	.50	
Cerium Oxalate—$Ce_2(C_2O_4)_3.9H_2O$		.30	
Cerium Oxide c.p.—CeO_2			
Cerium (ic) Sulfate—$Ce(SO_4)_2+4H_2O$			
Cerium Tungstate c.p.			
Charcoal Animal	.30		
Charcoal Animal treated with acid, moist	.85		
Charcoal Blood c.p.	3.25	.50	
Charcoal Wood powd.	.25		
Charcoal Wood sticks			Doz., .50
Chinaldine—$C_{10}H_9N$			
Chloralhydrate cryst.—$CCl_3.CH(OH)_2$	3.85	.60	
Chloranil—$C_6Cl_4O_2$			
Chloraniline-p—$ClC_6H_4.NH_2$			
Chlorethane, penta—C_2HCl_5			
Chlorethane, extra—$C_2H_2Cl_4$			
Chlorinated Lime see Calc. hypochlorite			
Chlorine cubes for generating Cl	.55		
Chlorine Water	.55		
Chloroacetic anhydride—$(ClCH_2CO)_2O$			
Chloroacetyl Chloride—$Ch_2Cl.COCl$			
Chlorocarbonic Ester (Ethyl)—$ClCO_2C_2H_5$			
Chloroform pure U.S.P.	1.55	.30	
Chloroform pure Squibbs	2.60		
Chloroform purif. for anaesthesia	1.55	.30	
Chloroform c.p.—$CHCl_3$	2.55	.50	
Chloro Naphthalene—$C_{10}H_7Cl$.			
Chloropicrin—Cl_3CNO_2			
Chlorotoluene-o—$ClC_6H_4.CH_3$			
Chlorotoluene-p—$ClC_6H_4.CH_3$			
Chrome Alum see Chrom. Potass. sulfate			
Chrome Green see Chrom. oxide			
Chrome Yellow see Lead chromate ppt			

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Chromium Metal—Cr				
Chromium Acetate basic c.p.—$Cr(C_2H_3O_2)_3+H_2O$		6.10	.90	
Chromium Ammon. Sulfate see Ammonium Chromium Sulfate				
Chromium Borate c.p.			.65	
Chromium Bromide c.p.—$CrBr_3$			1.25	
Cromium Carbonate basic c.p.—$CrCO_3$		3.35	.50	
Chromium (ic) **Chloride** subl—Cr_2Cl_6				
Chromium (ic) **Chloride** dry c.p.		2.50	.50	
Chromium (ic) **Chloride** solut. 50% c.p.		1.30	.25	
Chromium Fluoride c.p.—CrF_3+4H_2O		3.35	.50	
Chromium Hydroxide dry—$Cr_2(OH)_6+4H_2O$		1.40	.30	
Chromium Hydroxide c.p.		1.80	.35	
Chromium Nitrate dry c.p.		3.00	.45	
Chromium Nitrate solut. 40% c.p.—$Cr_2(NO_3)_3+Aq.$		1.65	.30	
Chromium Oxalate c.p.—$Cr(C_2O_4)+H_2O$		2.20	.45	
Chromium Oxide c.p.—Cr_2O_3		3.35	.50	
Chromium Phosphate c.p.—$Cr_2(PO_4)_2$		2.40	.50	
Chromium Phosphate tri (see Acid chromic)				
Chromium Potass. Sulfate (Chromic alum)		1.00		
Chromium Potass. Sulfate c.p. (Chromic alum)—$Cr_2K_2(SO_4)_4+24H_2O$		1.80	.35	
Chromium Potassium Sulfate c.p. powd.		2.05	.40	
Chromium Sulfate dry c.p.—$5Cr_2O_3.8SO_3+Aq.$		3.15	.45	
Chromium Sulfate 30% solut. c.p.		1.35	.25	
Chrysarobin (Acid chrysophanic)—$C_{30}H_{26}O_7$			1.10	
Chrysoidine, crystals—$C_{12}H_{13}N_4Cl$	25 grm. 2.70			
Cinchonidine Alkaloid—$C_{19}H_{22}N_2O$			2.40	
Cinchonidine Sulfate U.S.P.—$(C_{19}H_{22}N_2O)_2.H_2SO_4+3H_2O$			1.70	
Cinchonine Crystals—$C_{19}H_{22}N_2O$			1.50	
Cinchonine Hydrachloride—$C_{19}H_{22}N_2O.HCl+2H_2O$			1.10	
Cinchonine Sulfate U.S.P.—$(C_{19}H_{22}N_2O)_2.H_2SO_4+2H_2O$			1.25	
Cinnamic Aldehyde—$C_6H_5.CH:CH.CHO$			2.30	
Cobalt Metal cubes—Co			.80	
Cobalt Acetate c.p.—$Co(C_2H_3O_2)_2+4H_2O$		5.20	.80	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Cobalt Ammonium Chloride c.p.		3.90	.60	
Cobalt Ammon. Sulfate c.p.— $CoSo_4(NH_4)_2SO_4+6H_2O$		3.25	.50	
Cobalt Arsenate c.p.— $Co_3(AsO_4)_2+8H_2O$			1.20	
Cobalt Bromide c.p.—$CoBr_2+Aq$			1.10	
Cobalt Carbonate c.p.—$CoCO_3$		4.25	.65	
Cobalt Chloride c.p.—$CoCl_2+6H_2O$		3.15	.50	
Cobalt Chromate c.p.— $Co_2CrO_4(OH)_2+H_2O$		5.80	.85	
Cobalt Hydroxide c.p.—$Co_2O_3.3H_2O$		4.60	.70	
Cobalt Nitrate c.p.—$Co(NO_3)_2+6H_2O$		3.15	.50	
Cobalt Nitrate anhydr. c.p.		3.60	.55	
Cobalt Nitrate c.p. 10% Solution		.55		
Cobalt Oxalate c.p.—$CoC_2O_4+2H_2O$		4.65	.70	
Cobalt Oxide c.p.—Co_2O_3		3.90	.60	
Cobalt Oxide special from Nitrate		5.40	.80	
Cobalt Phosphate c.p.— $Co_3(PO_4)_2+2H_2O$			1.40	
Cobalt Sulfate c.p.—$CoSO_4+7H_2O$		2.55	.50	
Cobalt Sulfate anhydr. c.p.		3.15	.50	
Cocoa Butter				
Cochineal		2.05	.40	
Cochineal powd.		2.20	.45	
Colchicine—$C_{22}H_{25}NO_6$	10 gr. 3.05			
Collodion U.S.P.		.95		
Collodion U.S.P. flexible		1.35	.30	
Cologne Spirit see Alcohol Ethylic				
Colophony see Rosin				
Columbian Spirit see Alcohol Methylic				
Convallamarin—$C_{23}H_{44}O_{12}$	15 gr. 1.60			
Convallarin—$C_{34}H_{62}O_{11}$	15 gr. 1.60			
Copper Metal, gran.—Cu		.90		
Copper Metal, foil, thin		2.65	.55	
Copper Metal, sheet		.80		
Copper Metal, turnings		1.05	.20	
Copper Acetate basic, refined powder —$CuO.Cu(C_2H_3O_2)_2+6H_2O$				
Copper Acetate neutral pure cryst				
Copper Acetate c.p.— $Cu(C_2H_3O_2)_2+H_2O$		1.80	.35	
Copper Acetoarsenite (Paris Green) c.p.—$3CuOAS_2O_3.Cu(C_2H_3O_2)_2$		3.35	.50	
Copper Ammon. Chloride c.p.— $CuCl_2.2NH_4Cl+2H_2O$		.85		
Copper Ammon. Sulfate c.p.— $CuSO_4 4NH_3+H_2O$		.85		
Copper Arsenate c.p.— $Cu_3(ASO_4)_2.4H_2O$		2.55	.50	
Copper Arsenite c.p.—$Cu_3As_2O_6$		1.85	.35	
Copper Bichloride see Copper (ic) Chloride				
Copper Borate c.p.		3.05	.45	
Copper Bromide c.p.—$CuBr_2$			1.00	
Copper Carbonate pure		.85		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Copper Carbonate c.p.— $CuCO_3+Cu(OH)_2$		1.85	.35	
Copper (ic) **Chloride** c.p.— $CuCl_2+2H_2O$		1.10	.20	
Copper (ic) **Chloride** anhydr. c.p.		1.35	.25	
Copper (ous) **Chloride** c.p.—Cu_2Cl_2		1.85	.35	
Copper Citrate—$2Cu_2C_6H_4O_7+5H_2O$			.50	
Copper (ous) **Cyanide** c.p.— $Cu(CN)_2$		3.30	.50	
Copper Fluoride c.p.—CuF_2+2H_2O		1.85	.35	
Copper Formate c.p.—$Cu(CHO_2)_2$		3.30	.50	
Copper Hydroxide c.p.—$Cu(OH)_2$		1.85	.35	
Copper (ous) **Iodide** c.p.—Cu_2J_2			1.30	
Copper (ous) **Monochloride** see Copper (ous) Chloride				
Copper Nitrate techn.		.65		
Copper Nitrate c.p.— $Cu(NO_3)_2+3H_2O$		1.00	.20	
Copper Oleate—$Cu(C_{18}H_{33}O_2)_2$		2.70	.55	
Copper Oxalate c.p.—CuC_2O_4		3.15	.55	
Copper Oxide black fine c.p.—CuO		1.75	.35	
Copper Oxide black coarse c.p.		1.80	.35	
Copper Oxide red c.p.—Cu_2O		3.50	.50	
Copper Oxide wire c.p.—CuO		1.85	.35	
Copper Pentammoniate c.p.		1.75	.35	
Copper Phosphate c.p.—$CuHPO_4$		3.15	.45	
Copper Potass. Chloride c.p.— $CuCl_2.2KCl+2H_2O$		1.65	.35	
Copper Potass. Sulfate c.p.		1.65	.35	
Copper Silicate c.p.—$CuSiO_3$		1.25	.25	
Copper Subacetate see Copper Acetate Basic				
Copper Suboxide see **Copper Oxide** red				
Copper Sulfate cryst. techn.		.45		
Copper Sulfate techn. powd.		.45		
Copper Sulfate cryst. pure		.55		
Copper Sulfate cryst. c.p.— $CuSO_4+5H_2O$		.95		
Copper Sulfate c.p. crystals special		1.15	.25	
Copper Sulfate anhydr. c.p.—$CuSO_4$		1.50	.30	
Copper Sulfide c.p.—CuS		1.95	.40	
Copper Sulfide c.p. pptd.		2.20	.45	
Copper Sulfite—$Cu_2SO_3+H_2O$				
Copper Tartrate c.p.— $CuC_4H_4O_6+3H_2O$		2.60	.55	
Copperas see Iron (ous) sulfate				
Corallin (indicator)				
Corrosive Sublimate see Mercury (ic) Chloride				
Cotoin Para—$C_{12}H_8O_4$	15 gr., .20		5.75	
Cotoin True— $C_6H_2(OH)_2(OCH_3)COC_6H_5$				
Cotton absorbent		.90		
Cotton non-absorbent	12 ounce	.80		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Cotton Wool for culture tubes	bundle .30			
Cream Tartar see Potass. Bitartrate				
Creolin Pearson's		1.10		
Creosote from Coal Tar		.55		
Creosote U.S.P.		3.50	.55	
Creosote carbonate				
Cresol U.S.P.—C_7H_7OH		.60		
Cresol Ortho—$C_6H_4.OH.(CH_3)[1:2]$				
Crocus martis see Iron Oxide red				
Croton Chloralhydrate (Butyl Chloralhydrate) $C_4H_7O_2Cl_3$				
Cumarin—$C_6H_4.O.CO.(CH_2)$				
Cumene (Cumol)		1.45	.30	
Cupferron				
Curare				
Cyanacetic Ester (Ethyl)—CH_3CO_2CN				
Damar Gum				
Delphinine Amorphous—$C_{22}H_{35}NO_6$	15 gr. 3.50			
Dermatol see Bismuth subgallate				
Dextrin techn. yellow or white		.50		
Dextrin alc. ppt. c.p.—$(C_6H_{10}O_5)n+xH_2O$		6.40	.95	
Dextrose (Glucose) tech.				
Destrose (Glucose) c.p.—$C_6H_{12}O_6$		1.95	.40	
Diacetyl—$CH_3.CO.CO.CH_3$				
Diacetyldioxim see Dimethylglyoxime—$[CH_3C.(NOH)]_2$				
Diamidophenol Hydrochloride see Amidol				
Diamond Ink			1.30	
Diastase of **Malt** medic		7.00	1.05	
Diatomaceous Earth see Infusorial earth				
Dibromobenzene-p—$C_6H_4Br_2$				
Dichlorohydrin—$CH_2Cl.CHOH.CH_2Cl$				
Diethylamine—$(C_2H_5)_2NH$				
Diethylmalonic ester (ethyl)—$CO_2.C_2H_5CH_2CO_2C_2H_5$				
Digalen (Sol. Digitoxin)				
Dimethylamidoazobenzene Para—$C_6H_5.N_2C_6H_4N(CH_3)_2$				
Dimethylamidobenzaldehyde Para—$(CH_3)_2N.C_6H_4.CHO$				
Dimethylamine Hydrochloride—$(CH_3)_2NH.HCl$				
Dimethylaniline (Dimethylamido Benzol)—$C_6H_5N(CH_3)_2$				
Dimethylbenzene see Xylene				
Dimethylethylcarbinol see Amylene Hydrate				
Dimethylglyoxime (Diacetyldioxime)—$(CH_3)_2C_2(NOH)_2$			5.00	
Dimethylsulfate—$(CH_3)_2SO_4$		2.55	.50	
Dinitrobenzene—$C_6H_4(NO_2)_2$				
Dioxyanthraquinone see Alizarine				

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Dioxytriphenylphtalide see Phenolphtalein				
Dipenteneglycol see Terpinhydrate				
Diphenylamine—$(C_6H_5)_2NH$				
Diphenylcarbamine Chloride—$C_{13}H_{10}NClO$				
Diphenyl Ether—$C_6H_5OC_6H_5$				
Distilled Water—H_2O	Gal. .25			10 gal. 2.00
Dulcit—$C_6H_8(OH)_6$				
Dutch Metal leaf	Book .25			
Dyes, Aniline see Stains				
Elaterium			2.05	
Emery fine, medium and coarse powd		.40		
Emetin Resinoid	⅛ oz. 2.45			
Emetine Alkaloid	5 gr. 1.70			15 gr. 3.75
Emetine Hydrochloride—$C_{30}H_{44}N_2O_4.HCl$	1 gr. .75			5 gr. 1.70
Epichlorhydrin (Chloropropylene Oxide)—C_3H_5ClO				
Epsom Salt see Magnes. Sulfate				
Ergotin Bonjean			1.25	
Eschkas Mixture see Mag. Oxide and Sod. Carbonate				
Eserine Alkaloid (Physostigmine)—$C_{15}H_{21}N_3O_2$				
Eserine Hydrobromide—$C_{15}H_{21}N_3O_2.HBr$	5 gr. 3.25			
Eserine Hydrochloride—$C_{15}H_{21}N_3O_2.CHl$				
Eserine Salicylate U.S.P.—$C_{15}H_{21}N_3O_2.C_7H_6O_3$	5 gr. 2.20			
Eserine Sulfate U.S.P.—$(C_{15}H_{21}N_3O_2)_2.H_2SO_4$	1 gr. .75			
Eserine Pilocarpine	3 gr. 1.30			
Ether (Sulfuric) Ethylic Ether conc. U.S.P.—$(C_2H_5)_2O$		.80		
Ether (Sulfuric) Ethylic washed		.80		
Ether (Sulfuric) Ethylic dist. over Na		1.80	.35	
Ether (Sulfuric) Ethylic Squibb		1.25		
Ether Acetic U.S.P.		1.80	.35	
Ether Acetic absol. c.p.—$CH_3COOC_2H_5$		2.75	.55	
Ether Amylacetic see Amyl Acetate				
Ether Petrolic		.80		
Ether Petrolic, Special		1.10		
Ether Pyroacetic see Acetone				
Ethyl Acetate see Ether Acetic				
Ethyl Benzoate—$C_6H_5COO.C_2H_5$		6.75	.90	
Ethyl Bromide—C_2H_3Br		3.00	.60	
Ethyl Butyrate conc.		4.90	.95	
Ethyl Butyrate absol.—$C_3H_7.COOC_2H_5$				
Ethyl Formate conc—$HCOO.C_2H_5$		4.80	.70	
Ethyl Hydroxide see Alcohol Ethylic				
Ethyl Iodide—C_2H_5J			1.00	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Ethyl Oxide see Ether Sulfuric		
Ethyl Salicylate—$C_6H_4.OH.COOC_2H_5$		
Ethyl Valerianate—$C_7H_{14}O_2$	10.40	1.00
Ethylene Bromide (Dibromethane) —$CH_2Br.CH_2Br$		
Ethylidenediethylic Ether see Acetal		
Ethylmorphine Hydrochloride see Dionin		
Ethyl Oxalate—$C_2O_4(C_2H_5)_2$		
Ethylurethane see Ethyl Carbamate		
Eucalyptol—$C_{10}H_{18}O$	2.95	.60
Eugenol—$C_{10}H_{12}O_2$	8.00	.90
Euphorin (Phenyl Urethane)— $C_6H_5(NH)CO_2.C_2H_5$		2.00
Euquinine (Quinine Carbonic Ether) $OC_2H_5.CO.OC_{20}H_{23}N_2O$		5.40
Feldspar	.25	
Ferric and Ferrous Salts see Iron		
Fluorescein (Diresocinolphtalein)— $C_{20}H_{12}O_5+H_2O$		2.30
Fluorescin (Resorcinolphtalein)— $C_{20}H_{14}O_5$		
Fluorspar see Calcium Fluoride native		
Formaldehyde Medic. U.S.P. 40% (Oxymethylene)—H.CO.H	.55	
Formamide (Methanamide)— $H.CO.NH_2$		
Formin (Hexamethylenamine U.S.P.) —$(CH_2)_6N_4$	2.15	.45
Formol see Formaldehyde		
Formonitrile see Acid Hydrocyanic		
Fossil Flour see Infusorial earth		
Fructose see Levulose		
Fruit Sugar see Levulose		
Fullers Earth		
Furfurol (Pyromucic aldehyde)— $C_5H_4O_2$		
Fusel Oil see Alcohol Amylic		
Gaduol (Alc. Extr. Cod Liver Oil)		1.25
Galactose c.p. (Lactoglucose)— $C_6H_{12}O_6$		
Galena see Lead Sulfide native		
Garantose refined (Benzosulfinide)— $C_7H_5NO_3S$		2.30
Gasoline	.20	
Gelatine, Difco	2.70	
Glass Soluble see Potass. or Sodium silicate		
Glass Wool coarse	4.00	.40
Glass Wool fine	5.00	.50
Glucose see Dextrose		
Glycerin c.p—$C_3H_5(OH)_3$	1.25	.25
Glycerol Monochloride— $C_3H_5(OH)_2Cl$		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Glycocoll (Aminoacetic acid)— $CH_2(NH_2)COOH$				
Clycol—$OHCH_2.CH_2OH$				
Glycol Diacetate— $C_2H_3O_2.CH_2.CH_2CH_2H_3O_2$				
Glycophenol see Saccharine				
Glycosine see Saccharine				
Glycyrrhizin Ammoniated— $C_{44}H_{63}NO_{18}$				
Gold Leaf	Book .75			
Gold Bromide mono—$AuBr$	5 gr. 1.00			15 gr. 2.00
Gold Chloride—$AuCl_3+HCl+4H_2O$	⅛ oz. 2.20		16.65	
Gold Cyanide mono-pure—$AuCN$	5 gr. 1.20			15 gr. 2.30
Gold Oxide—Au_2O_3				
Gold Sodium Chloride—$AuCl_3+NaCl$	⅛ oz. 1.55		8.60	
Grape Sugar see Glucose				
Graphite powder		.90		
Guaethol (Guaiacol Ethyl— $C_6H_4.OC_2H_5.OH$			2.00	
Guaiacol—$C_7H_8O_2$			2.40	
Guaiacol Carbonate—$C_{15}H_{14}O_5$			4.65	
Gum Arabic white best		1.20	.25	
Gypsum see Calcium Sulfate				
Hematoxylin pure cryst. see Stains				
Hemoglobin powder			.65	
Hexamethylenamine see Formin				
Hexamethylenamine Bromethylate see Bromalin				
Hexaoxyanthraquinone see Acid Rufigallic				
Hide Powder com'l		.70		
Hide Powder for standardizing		6.85	1.05	
Homatropine Hydrobromide— $C_{16}H_{21}NO_3.HBr$	1 gr. 1.10			
Homatropine Hydrochloride— $C_{16}H_{21}NO_3.HCl$	5 gr. 3.60			
Homatropine Salicylate— $C_{16}H_{21}NO_3.C_7H_6O_3$	5 gr. 3.60			
Hydrastine Alkaloid—$C_{21}H_{21}NO_6$		31.00		
Hydrastine Hydrochloride— $C_{21}H_{21}NO_6.HCl$				
Hydrastine Sulfate— $C_{21}H_{21}NO_6)_2.H_2SO_4$			37.00	
Hydrogen Peroxide 3% = 10 Vol. % S.U.P.—H_2O_2+Aq		.50		
Hydrogen Peroxide 3% Marchand		.85		
Hydroquinone (Paradioxybenzene) $C_6H_6O_2$			.60	
Hydroxybenzene see Acid Carbolic				
Hydroxylamine Hydrochloride— $NH_2.OH.HCl$			2.00	
Hydroxylamine Sulfate— $(NH_2OH).H_2SO_4$			3.20	
Hyoscine Hydrobromide— $C_{17}H_{21}NO_4.HBr+3H_2O$	1 gr. 1.65			15 gr. 14.40

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Hyoscine Hydrochloride— $C_{17}H_{21}NO_4.HCl+2H_2O$	3 gr. 3.70			5 gr. 6.00
Hyoscine Sulfate— $C_{17}H_{21}NO_4)_2.H_2SO_4$	3 gr. 3.70			5 gr. 6.00
Hyoscyamine Alkaloid amorph	5 gr. 2.05			15 gr. 4.50
Hyoscyamine Alkaloid cryst.— $C_{17}H_{23}NO_3$	5 gr. 2.65			15 gr. 6.10
Hyoscyamine Hydrobromide— $C_{17}H_{23}NO_3.HBr$				
Hyoscyamine Sulfate cryst— $C_{17}H_{23}NO_3)_2.H_2SO_4$	5 gr. 1.20			15 gr. 2.50
Iceland Spar for standardizing			.65	
Indigo Madras				
Indigo-Carmine paste				
Indigo-Carmine dry— $C_{16}H_8N_2O_2(SO_3Na)_2$				
Indophenol— $(CH_3)_2:N.C_6H_4.N:C_{10}H_6.O.$	1 grm. 7.50			
Induline, spirit sol	100 grm. 5.50			
Induline, water sol	100 grm. 6.50			
Infusorial Earth		.20		
Iodine resublimed—J.		6.75	1.00	
Iodine Pentoxide see [Acid] jodic anhydr				
Iodobenzene—C_6H_5J				
Iodoform cryst. or powd—CHJ_3		7.75	1.15	
Iron Filings		.25		
Iron Powder		.45		
Iron Powder reduced by hydrogen		2.20	.45	
Iron Wire				¼ lb. spool
for standardizing on spools—Fe			.45	.65
Iron Acetate basic— $Fe_2(OH)_2(C_2H_3O_2)_4$		1.65	.35	
Iron (ic) **Albuminate** scales		4.65	.70	
Iron (ic) **Ammon. Chloride** c.p.		.90		
Iron (ic) **Ammon. Citrate** brown scales		2.05	.40	
Iron (ic) **Ammon. Citrate** green scales		2.65	.55	
Iron (ic) **Ammon. Oxalate** c.p.— $(NH_4)_3Fe(C_2O_4)_3+3H_2O$		2.20	.45	
Iron (ic) **Ammon. Sulfate** c.p.— $Fe_2(NH_4)_2SO_4)_4+24H_2O$		.90		
Iron (ous) **Ammon. Sulfate** pure		.60		
Iron (ous) **Ammon. Sulfate** c.p.— $Fe_2(NH_4)_2SO_4)_2+6H_2O$		.75		
Iron (ous) **Ammon. Sulfate** c.p. large cryst.		1.15	.25	
Iron (ous) **Ammon. Sulfate,** special, 100% Cu, P, Zn, Cl free		1.35	.30	
Iron (ous) **Bromide**—$FeBr_2+6H_2O$			.85	
Iron (ic) **Carbonate** c.p. moist special		.75		
Iron (ous) **Carbonate** moist c.p.— $FeCO_3$		.75		
Iron (ic) **Chloride** cryst. C.P.		.75		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Iron (ic) **Chloride** cryst. c.p. special Phos. free—$FeCl_3+6H_2O$	1.85	.40
Iron (ic) **Chloride** anhydr. subl.—$FeCl_3$		
Iron (ous) **Chloride** c.p. dry—$FeCl_2+Aq$	1.15	.25
Iron (ous) **Chloride** c.p.—$FeCl_2+4H_2O$	1.05	.20
Iron (ic) **Citrate** scales U.S.P.—$Fe_2(C_6H_5O_7)_2+6H_2O$	2.25	.45
Iron (ic) **Ferrocyanide** insoluble—$Fe_4Fe_3(CN_6)_3$	2.85	.55
Iron (ic) **Ferrocyanide** soluble	2.85	.55
Iron (ic) **Fluoride** c.p.—FeF_3	1.85	.35
Iron (ic) **Glycerophosphate**	5.40	.80
Iron (ic) **Hydroxide** moist c.p.—$Fe(OH)_3$	1.00	.20
Iron (ic) **Hypophosphite** U.S.P.—$Fe(H_2PO_2)_3$	3.50	.50
Iron (ous) **Iodide**—FeJ_2+3H_2O	6.30	.95
Iron (ous) **Iodide** saccharated		.55
Iron (ous) **Lactate** powd—$Fe(C_3H_5O_3)_2.3H_2O$	2.85	.55
Iron Lactophosphate	4.50	.70
Iron (ic) **Nitrate** cryst. c.p.—$Fe(NO_3)_3+18H_2O$	1.15	.25
Iron (ous) **Nitrate** solution—$Fe(NO_3)_2$	.85	
Iron (ous) **Oleate** c.p.	.85	
Iron (ic) **Oxalate** cryst. c.p.—$Fe_2(C_2O_4)_3$	3.35	.50
Iron (ous) **Oxalate** c.p.—$FeC_2O_4+2H_2O$	2.30	.45
Iron (ic) **Oxide** red ignited—Fe_2O_3	.95	
Iron (ic) **Oxide** red c.p.—$Fe_2O_3(OH)_2$	.95	
Iron (ic) **Oxide** red saccharated	.90	
Iron (ic) **Oxide** c.p. Special from Oxalate—Fe_2O_3	1.85	.35
Iron (ous) **Oxide** c.p. from Oxalate—FeO	2.30	.45
Iron (ic) **Peptonate** (Peptonized)	4.55	.70
Iron Perchloride see iron (ic) chloride		
Iron Persulfate see Iron (ic) Sulfate		
Iron (ic) **Phosphate** ppt. C.P.—$Fe_2(PO_4)_2+8H_2O$	1.25	.25
Iron (ic) **Phosphate** soluble U.S.P.	1.95	.40
Iron (ous) **Phosphate** c.p.—$Fe_3(PO_4)_2.8H_2O$	1.25	.25
Iron (ic) **Potass. Oxalate**—$K_3Fe(C_2O_4)_3+3H_2O$	2.45	.50
Iron (ous) **Potass. Sulfate** c.p.	1.10	.25
Iron (ic) **Potass. Tartrate** scales—$Fe_2O_3K_2(C_4H_4O_6)_2$	2.60	.50

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Iron (ic) **Pyrophosphate** soluble scales—$Fe_4(P_2O_7)_3$		2.05	.40	
Iron (ic) **Quinine Citrate** soluble		6.50	1.00	
Iron (ic) **Quinine Strychnine Citrate**		7.00	1.05	
Iron (ic) **Sodium Oxalate**— $Na_3Fe(C_2O_4)_3+4\frac{1}{2}H_2O$		1.85	.45	
Iron (ic) **Succinate**— $Fe(OH)C_4H_4O_4$			1.15	
Iron (ic) **Sulfate** Basic c.p.— $Fe_4O(SO_4)_5$		.70		
Iron (ic) **Sulfate** C.P.—$Fe_2(SO_4)_3$		.65		
Iron (ous) **Sulfate** c.p. Phos. free		1.00	.20	
Iron (ous) **Sulfate** C.P.— $FeSO_4.7H_2O$		.55		
Iron (ous) **Sulfate** tech		.30		
Iron (ous) **Sulfate** c.p. anhyd		.90		
Iron Sulfide lumps—FeS		.30		
Iron Sulfide gran		.30		
Iron Sulfide sticks		.35		
Iron (ic) **Valerate**				
Isatin—$C_8H_5NO_2$	1 grm. 2.00			
Isinglass American best				
Isinglass Japanese see Agar Agar				
Isoamyl Bromide—$C_5H_{11}Br$				
Isoamyl Ether				
Isobutyl Aldehyde—$(CH_3)_2CH.CHO$				
Isobutylcarbinol see Alcohol amylic				
Isopropyltoluene see Cymene				
Ivory Black see Charcoal, Animal				
Japan Wax see Wax				
Kaolin		.35		
Kaolin Acid washed		.55		
Kaolin washed and ignited		.60		
Kermes Mineral see Antimony Sulfide red				
Kieselguhr see Infusorial Earth				
Kryolith		.55		
Lacmoid scales— $C_6H_3(OH)_2.N:O.OH.C_6H_3$				
Lactose (Milk Sugar) powd		1.10	.20	
Lactose (Milk Sugar) cryst. c.p.— $C_{12}H_{22}O_{11}+H_2O$		1.60	.30	
Lampblack		.60		
Lanum (Wood Fat)		.95		
Lanum anhydr. (Wool Fat)		1.10	.20	
Lead, com'l sheet		.35		
Lead, Shot		.40		
Lead, Test Lead Ag free gran		.55		
Lead, Com'l. Mossy		.50		
Lead Metal com'l sticks—Pb		.55		
Lead Acetate cryst. techn		.55		
Lead Acetate cryst. U.S.P.		.60		
Lead Acetate powd. U.S.P.		.70		
Lead Acetate gran. U.S.P.		.60		
Lead Acetate c.p.—$Pb(C_2H_3O_2)_2.3H_2O$		.65		
Lead Acetate (sub) Basic solut. C.P.		.60		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Lead Acetate (sub) Basic c.p. dry	1.10	
Lead Acetate (sub) c.p. Monbasic	1.00	.20
Lead Acetate Tribasic c.p.— $Pb(C_2H_3O_2)_2 2PbO+H_2O$	1.80	.35
Lead Arsenate c.p.	2.50	.50
Lead Arsenate c.p. (Acid)	2.45	.50
Lead Arsenite c.p.		.65
Lead Borate c.p.—$Pb(BO_3)_2+H_2O$		.40
Lead Bromide c.p.—$PbBr_2$		
Lead Carbonate (White Lead)	.45	
Lead Carbonate c.p.— $2PbCO_3.Pb(OH)_4$	.95	
Lead Chloride pure	1.20	.25
Lead Chloride c.p.—$PbCl_2$	.90	
Lead Chromate powd. c.p.—$PbCrO_4$	1.65	.35
Lead Chromate c.p. fused—$PbCrO_4$	1.65	.35
Lead Dioxide see Lead Oxide Brown		
Lead Fluoride c.p.—PbF_2	1.65	.35
Lead Hydroxide c.p.—$2PbO.H_2O$	1.45	.30
Lead Iodide—PbJ_2	5.75	.85
Lead Nitrate pure	.50	
Lead Nitrate c.p.—$Pb(NO_3)_2$	.60	
Lead Oleate—$Pb(C_{18}H_{33}O_2)_2$	1.55	
Lead Oxalate c.p.—PbC_2O_4	1.80	.35
Lead Oxide di- Brown techn. (Peroxide)	1.45	.30
Lead Oxide di- Brown c.p.—PbO_2	2.00	.40
Lead Oxide di- Brown c.p. Special	2.70	.55
Lead Oxide Mono- Yellow (Litharge)	.40	
Lead Oxide Mono- Yellow c.p.—PbO	.60	
Lead Oxide Red (Minium)	.35	
Lead Oxide Red c.p.—Pb_3O_4	.55	
Lead Palmitate c.p.	1.25	.25
Lead Peroxide see Lead Oxide-di-Brown		
Lead Phosphate c.p.—$Pb_3(PO_4)_2$	2.30	.45
Lead Silicofluoride c.p.— $PbSiF_6+H_2O$	3.35	.50
Lead Stearate c.p.— $Pb(C_{18}H_{35}O_2)_2$	1.35	.25
Lead Subacetate see Lead acetate Basic		
Lead Sulfate	.90	
Lead Sulfate c.p.—$PbSO_4$	1.00	.20
Lead Sulfide native (Galena)	.55	
Lead Sulfide c.p.—PbS	.95	
Lead Tannate		.45
Lead Tartrate c.p—$PbC_4H_4O_6$	2.75	.55
Lecithin—$C_{42}H_{84}NPO_9$		3.05
Levulose Syrup (laev'ose)— $C_6H_{12}O_6+Aq$		
Levulose cryst—$C_6H_{12}O_6$		
Levulose from Inulin		
Ligroin		
Lime see Calcium Oxide		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Lime Chlorinated see Calc. Hypochlorite		
Litharge see Lead Oxide-Mono		
Lithium Metal cubes—Li		
Lithium Acetate—$LiC_2H_3O_2+2H_2O$	3.25	.50
Lithium Benzoate U.S.P.—$LiC_7H_5O_2$		1.25
Lithium Bitartrate—$LiC_4H_5O_6+H_2O$	4.50	.70
Lithium Bromide U.S.P.—LiBr	4.55	.70
Lithium Carbonate pure—Li_2CO_3	2.65	.55
Lithium Carbonate c.p.	4.00	.60
Lithium Chloride C.P.—LiCl	3.40	.50
Lithium Citrate C.P.— $C_3H_4.OH.(COOLi)_3.4H_2O$	3.50	.55
Lithium Fluoride C.P.—LiF	6.75	1.00
Lithium Iodide—LiJ		1.05
Lithium Nitrate C.P.—$LiNO_3$	4.25	.65
Lithium Phosphate—$2Li_3PO_4+H_2O$	4.15	.60
Lithium Salicylate U.S.P.—$LiC_7H_5O_3$		
Lithium Sulfate C.P.—$Li_2SO_4+H_2O$	3.65	.55
Litmus cubes	2.70	.55
Litmus powd.	3.00	.55
Litmus Paper see Test Papers		
Logwood	1.15	.25
Logwood Extract		
Lycopodium		
Lysol		
Magnesia see Magnesium Oxide		
Magnesium, for Grignard		
Magnesite calcined	.45	
Magnesium Metal powd.—Mg	8.50	1.25
Magnesium Metal ribbon		2.50
Magnesium Metal Rods—Mg		
Magnesium Metal Wire		
Magnesium Acetate c.p— —$Mg(C_2H_3O_2)_2+4H_2O$	1.55	.30
Magnesium Aluminum Sulfate c.p.— $MgSO_4Al_2(SO_4)_3$	1.10	.20
Magnesium Ammon. Chloride c.p.— $MgCl._2(NH_4)Cl+6H_2O$	.75	
Magnesium Ammon. Phosphate C.P. —$Mg(NH_4)PO_4+6H_2O$	1.75	.35
Magnesium Ammon. Sulfate c.p.— $Mg(NH_4)_2(SO_4)_2$	.70	
Magnesium Borate c.p.— $Mg(BO_2)_2.8H_2O$		.45
Magnesium Borocitrate powd.	1.70	.35
Magnesium Bromide c.p.— $MgBr_2+6H_2O$		1.25
Magnesium Carbonate powd.	.80	
Magnesium Carbonate pure	.80	
Magnesium Carbonate c.p.—$MgCO_3$	1.10	.25
Magnesium Carbonate c.p. Special	2.40	.50
Magnesium Chloride cryst. pure	.60	
Magnesium Chloride cryst. c.p.— $MgCl_2+6H_2O$	.65	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Magnesium Chloride cryst. c.p. Special	1.25	.25
Magnesium Chloride fused lumps c.p.	.95	
Magnesium Chloride fused sticks c.p.	.95	
Magnesium Chromate c.p.— $MgCrO_4.7H_2O$	3.50	.50
Magnesium Citrate c.p.— $Mg_3(C_6H_5O_7)_2+14H_2O$		.60
Magnesium Fluoride c.p.—MgF_2	3.50	.50
Magnesium Formate c.p.— $Mg(CHO_2)_2.2H_2O$		
Magnesium Glycerophosphate— $MgPO_4C_3H_5(OH)_2$		.55
Magnesium Hypophosphite pure— $MgH_2PO_2)_2+6H_2O$		.40
Magnesium Iodide c.p.—MgJ_2+8H_2O		1.35
Magnesium Lactate pure— $Mg(C_3H_5O_3)_2+3H_2O$		.60
Magnesium Lactophosphate		.60
Magnesium Nitrate c.p.— $Mg(NO_3)_2+Aq$	.85	
Magnesium Nitrate c.p. fused	1.50	.30
Magnesium Oxalate c.p.— $MgC_2O_4+2H_2O$	2.75	.55
Magnesium Oxide light, U.S.P.	1.80	.40
Magnesium Oxide pure	1.80	.35
Magnesium Oxide heavy U.S.P.	1.65	.35
Magnesium Oxide c.p.—MgO	2.20	.45
Magnesium Oxide and **Sod. Carbonate** c.p.	2.15	.45
Magnesium Perborate c.p.	4.65	.70
Magnesium Peroxide c.p.	4.65	.70
Magnesium Phosphate primary c.p.	3.20	.50
Magnesium Phosphate secondary c.p.	1.15	.25
Magnesium Phosphate tertiary c.p.	1.70	.35
Magnesium Pyrophosphate c.p.— $Mg_2P_2O_7$	2.90	.60
Magnesium Salicylate— $Mg(C_7H_5O_3)_2+4H_2O$	2.05	.40
Magnesium Silicate c.p.— $3MgSiO_3+5H_2O$	3.35	.50
Magnesium Sulfate cryst. (Spsom salt)	.30	
Magnesium Sulfate cryst. (Epsom salt) c.p.—$MgSO_4+7H_2O$	.55	
Magnesium Sulfate anhydr. c.p.	.95	
Magnesium Sulfite—$MgSO_3+6H_2O$	.80	
Magnesium Tartrate c.p.— $MgC_4H_4O_6$	2.80	.55
Malonic Ester (Ethyl)— $CO_2HCH_2CO_2.CH_3CH_2$		
Malonic Ester (Methyl)— $CO_2CHC_2CO_2.CH_3$		
Maltose (Malt Sugar)— $C_{12}H_{22}O_{11}+H_2O$		
Manganese Metal cryst.—Mn		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.	
Manganese Metal pure			
Manganese Acetate c.p.— $Mn(C_2H_3O_2)_2+H_2O$	1.70	.35	
Manganese Borate c.p.—MnB_4O_7	1.20	.25	
Manganese Bromide c.p.—$MnBr_2$		1.15	
Manganese Carbonate c.p.—$MnCO_3$	1.30	.30	
Manganese Chloride techn.	.80		
Manganese Chloride c.p.— $MnCl_2+4H_2O$	.95		
Manganese Citrate c.p.—$MnHC_6H_5O_7$		.75	
Manganese Dioxide see Mangan. Peroxide			
Manganese Glycerophosphate— $MnC_3H_7O_3POO_2$		.75	
Manganese Hypophosphite U.S.P.— $Mn(H_2PO_2)_2+H_2O$	3.55	.55	
Manganese Iodide c.p.—MnJ_2		1.35	
Manganese Nitrate c.p. crystals— $Mn(NO_3)_2+Aq$	2.55	.50	
Manganese Nitrate c.p. Saturated Solution	1.65	.35	
Manganese Oxalate c.p.— $MnC_2O_4 2\frac{1}{2} H_2O$	3.00	.45	
Manganese Oxide brown c.p.—Mn_3O_4	1.35	.30	
Manganese Oxide hydrated c.p.— $Mn_2O_2(OH)_2$	.90		
Manganese Peptonized	7.20	1.10	
Manganese Peroxide nat. gran.	.50		
Manganese Peroxide nat. powd.	.40		
Manganese Peroxide c.p.—MnO_2	1.00	.20	
Manganese Peroxide powder c.p. Special	1.80	.35	
Manganese Phosphate c.p.— $Mn_3(PO_4)_2+7H_2O$	2.90	.60	
Manganese Sulfate c.p.— $MnSO_4+4H_2O$	1.40	.30	
Manganese Sulfide c.p.—MnS	3.00	.45	
Manganese Tartrate c.p.— $MnC_4H_4O_6$	4.70	.70	
Mannit—$C_6H_8(HO)_6$	6.30	.95	
Marble Chips see Calcium Carbonate			
Melamyprit see Dulcit			
Menthol cryst—$C_{10}H_{19}.OH$		1.15	
Mercury Metal—Hg	2.90		Special price in flasks of 75 lbs.
Mercury Metal redistilled	3.25		
Mercury (ic) **Acetate** c.p.— $Hg(C_2H_3O_2)_2$	4.65	.70	
Mercury (ous) **Acetate** c.p.— $Hg_2(C_2H_3O_2)_2$		1.15	
Mercury Ammoniated Chloride— $HgNH_2Cl$	4.00	.50	
Mercury (ic) **Bisulfate**—$HgSO_4$	2.90	.60	
Mercury (ic) **Bromide** c.p.—$HgBr_2$		1.35	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Mercury (ic) **Chloride** (Bi) cryst.—$HgCl_2$	3.90	.55
Mercury (ic) **Chloride** (Bi) c.p.	4.00	.60
Mercury (ous) **Chloride** c.p.—Hg_2Cl_2	4.35	.65
Mercury (ic) **Chromate** c.p.—$HgCrO_4$		1.35
Mercury (ic) **Cyanide** c.p.—$Hg(CN)_2$		1.35
Mercury Dimethyl		
Mercury (ic) **Iodide** red—HgJ_2		1.35
Mercury (ous) **Iodide**—HgJ		1.35
Mercury (ic) **Nitrate** c.p.—$Hg(NO_3)_2$	5.45	.85
Mercury (ous) **Nitrate** c.p.—$Hg(NO_3)+H_2O$	5.75	.90
Mercury Oleate 25% U.S.P.	2.70	.55
Mercury (ic) **Oxide Red** c.p.—HgO	5.10	.80
Mercury (ic) **Oxide Red** powder	3.95	.60
Mercury (ic) **Oxide Yellow** c.p.	5.45	.85
Mercury (ous) **Oxide Black** c.p.—Hg_2O	5.75	.90
Mercury (ic) **Oxycyanide**—$HgO.HgCN_2$		
Mercury Protoiodide see Mercury (ous) iodide		
Mercury Salicylate—$C_6H_4.CO.O.Hg$		.50
Mercury Subsulfate—$HgSO_4.2HgO$	2.90	.60
Mercury (ic) **Succinate**—$Hg(C_4H_4O_4)_2$		
Mercury (ic) **Sulfate** c.p.—$HgSO_4$	5.75	.90
Mercury (ous) **Sulfate** c.p.—Hg_2SO_4	5.45	.85
Mercury (ic) **Sulfide** c.p.	5.75	.90
Mercury (ic) **Sulfide** Red Cinnabar c.p.—HgS	5.45	.85
Mercury (ic) **Sulfide** Red powd. (Cinnabar)		
Mercury (ic) **Sulfocyanate** c.p.—$Hg(SCN)_2$	4.60	.70
Mercury (ous) **Tannate** pure		.40
Mercury with **Chalk** U.S.P.	1.70	.35
Mesitylene—$C_6H_3(CH_3)_3$		
Metadioxybenzene see Resorcin		
Metals Fusible see Alloys		
Methanamid see **Formamide**		
Methenyl Tribromide see Bromoform		
Methyl Acetate c.p.—$CH_3.COOCH_3$		1.05
Methyl Alcohol see Alcohol Methylic		
Methyl Anthranilate—$H_2N.C_6H_4CO_2CH_3$		3.30
Methyl Hydroxide see Alcohol Methylic		
Methyl Iodide c.p.—CH_3J		2.50
Methyl Orange (indicator)—$(CH_3)_2:N.C_6H_4.N:N.C_6H_4.SO_3Na$		1.10
Methyl Oxalate—$(CH_3)_2C_2O_4$		
Methyl Red (indicator)		9.00

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Methyl Salicylate (Synthetic Oil Wintergreen)—$C_8H_8O_3$	1.75	.35
Methyl Sulfate (Dimethyl sulfate) c.p.—$(CH_3)_2SO_4$		.75
Methylacetyl see Acetone		
Methylal pure (Formal)—$CH_2(OCH_3)_2$		
Methylamine Hydrochloride—CH_3NH_2HCl		
Methylbenzene see Toluene		
Methylbenzoylecgonine see Cocaine		
Methylenedimethylate see Methylal		
Methylene Iodide—CH_2J_2		
Methylenetetramine Hexa see Formin		
Methylethyl Ketone—$CH_3.CO.C_2H_5$		
Methylmorphine see Codeine		
Methylpara-amidometacresol Sulfate or **Hydrochloride** see Metol		
Methylpropylphenol Normal see Thymol		
Methylpropylphenyl Hexahydride see Menthol		
Methylprotocatechuic Aldehyde see Vanillin		
Methyltheobromine see Caffeine		
Methylthionine Hydrochloride (Methylene Blue Medic) see Stains		
(Metol) see Velatol substitute		
Microcosmic Salt see Sodium Amon. Phosphate		
Microscopical Stains see Stains		
Milk Sugar see Lactose		
Milk Sulfur see Sulfur praecipit		
Mineral Blue see Iron Ferrocyanide		
Mineral Carbon see Graphite		
Mineral Green see Copper Carbonate		
Mineral Pitch see Asphaltum		
Mineral Wax see Ceresin		
Mineral Wool	.35	
Minium see Lead Oxide red		
Mohr's Salt see Iron (ous) Ammon. sulfate		
Molybdaenum Trioxide see (Acid) Molybdic anhydr		
Monoamidodiphenylamine Hydrochloride see Diphenylhydrazine HCl		
Monobromethan see Ethyl Bromide		
Monobromo-Naphthalene—$C_{10}H_7Br$		
Monoiodoethane see Ethyl Iodide		
Monomethylaniline tech		1.30
Monomethylaniline c.p.—$CH_3NHC_6H_5$		2.40

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Monsel's Salt see Iron (ic) Sulfate Basic		
Morrhuol see Gaduol		
Naptha, Coal Tar, see Benzol		
Naptha, Petroleum, see Benzin		
Naptha, Wood, see Alcohol Methylic		
Naphthalene pure	.75	
Naphthalene Alcohol purif. c.p.—$C_{10}H_8$	1.50	.30
Naphthol Alpha—$C_{10}H_7.OH$		1.10
Naphthol Beta—$C_{10}H_7.OH$	3.20	.50
Naphthol Beta Benzoate—$C_{10}H_7.C_7H_5O_2$		1.20
Naphthol Beta Nitroso—$C_{10}H_6(NO)OH$		1.20
Naphthol Blue-Black		1.30
Naphthylamine Alpha—$C_{10}H_7.NH_2$		1.35
Naphthylamine Alpha Hydrochloride—$C_{10}H_7NH_2.HCl$		1.30
Naphthylamine Beta—$C_{10}H_7NH_2$	7.50	1.15
Naphthylamine Hydrochloride Beta—$C_{10}H_7NH_2.HCl$	4.10	.60
Nickel Metal shot—Ni	1.80	.30
Nickel Metal pure sheet	2.50	
Nickel Metal wire	4.75	.45
Nickel Acetate c.p.—$Ni(C_2H_3O_2)_2+4H_2O$	2.20	.35
Nickel Ammon. Sulfate	.50	
Nickel Ammon. Sulfate c.p.—$NiSO_4.(NH_4)_2SO_4+6H_2O$	.95	
Nickel Bromide c.p.—$NiBr_2$		1.20
Nickel Carbonate c.p.—$NiCO_3$	3.40	.50
Nickel Chloride c.p.—$NiCl_2$	2.15	.45
Nickel Chloride anhydr c.p.	3.00	.50
Nickel Cyanide tech.—$Ni(CN)_2+Aq$		.35
Nickel Hydroxide c.p.—$Ni(OH)_2+H_2O$	3.40	.50
Nickel Nitrate c.p.—$Ni(NO_3)_2.6H_2O$	1.55	.35
Nickel Oxalate c.p.—NiC_2O_4	3.35	.50
Nickel (ic) **Oxide** black	1.75	.35
Nickel (ic) **Oxide** black c.p.—Ni_2O_3	4.25	.65
Nickel (ous) **Oxide** green c.p.—NiO	2.55	.50
Nickel Phosphate c.p.—$Ni_3(PO_4)_2+7H_2O$	2.55	.50
Nickel Sulfate	.60	
Nickel Sulfate c.p.	2.55	.50
Nickel Sulfate c.p. anhyd.—$NiSO_4$	3.30	.50
Nickel Sulfide c.p.—NiS	3.55	.55
Nickel Tartrate c.p.—$NiC_4H_4O_6$	2.45	.50
Nitre see Potass. Nitrate		
Nitraniline-P—$NO_2.C_6H_4.NH_2$		3.20
Nitrobenzaldehyde-m—$NO_2.C_6H_4.CHO$		
Nitrobenzol rectif. (Oil Mirbane)—$C_6H_5NO_2$	.65	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Nitrobenzylchloride Para— $NO_2.C_6H_4.CH_2Cl$		
Nitro Chlorbenzole-P— $NO_2.C_6H_4.CH_2Cl.$	1.80	.35
Nitromethane—CH_3NO_2		
Nitron—$C_{20}H_{16}N_4$		
Nitronaphthalene—$C_{10}H_7NO_2$	2.40	.50
Nitro phenol-O—$NO_2C_6H_4.OH$	2.40	.40
Nitro phenol-P—$NO_2C_6H_4.OH$	5.70	.85
Nitroso dimethylaniline-P— $NO.C_6H_4N(CH_3)_2$	3.30	.50
Nitrotoluene Ortho— $C_6H_4.CH_3(NO_2)[1:2]$		
Nitrotoluene Para— $C_6H_4.CH_3(NO_2)[1:4]$		
Nutgall U.S.P.	1.00	.20
Nutgall U.S.P. powder	1.20	.25
Oil Almond Bitter true		.75
Oil Almond Bitter artific. see Benzaldehyde		
Oil Aniline see Aniline pure		
Oil Anise double rectif.		
Oil Apple see Amyl Valerate		
Oil Bergamot rectif.		1.20
Oil Cade U.S.P.	2.55	.50
Oil Cajeput rectif.		
Oil Castor		
Oil Cedar Wood		
Oil Cedar Wood for immersion		.55
Oil Cloves rectif.		
Oil Cotton Seed		
Oil Fennel Ia		
Oil Fusel see Alcohol Amylic		
Oil Lavender Ia		
Oil Lemon Ia		
Oil Linseed raw		
Oil Linseed boiled		
Oil Mirbane see Nitrobenzol		
Oil Mustard artif. (Allyl Sulfocyanide)—$C_3H_5.SCN$		2.75
Oil Mustard true dist.		
Oil Olive		
Oil Origanum Cretan Ia		
Oil Paraffin Yellow		
Oil Paraffin White		
Oil Peppermint rect.		
Oil Petroleum crude		
Oil Phenylmustard (Thiocarbanil)		
Oil Rape Seed		
Oil Turkey Red		
Oil Turpentine		
Oil Turpentine rectif. U.S.P.	.60	
Oil Wine true heavy		
Oil Wine true light		
Oil Wintergreen (Sweet Birch)		.85

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.	
Oil Wintergreen Synthetic see Benzyl Chloride			
Omegachlorotoluene see Methyl Salicylate			
Orcin—$CH_3.C_6H_3(OH)_2+H_2O$			
Orphol see Betanaphthol Bismuth			
Orpiment see Arsenic Sulfide yellow			
Orthodioxybenzene see Pyrocatechin			
Ortho Nitro phenol—$NO_2.C_6H_4.OH$	2.40		
Osmium Tetroxide see (Acid) Osmis Anhydride			
Oxalyl Chloride—ClOC.COCl.			
Ox-Gall inspiss	1.80	.35	
Ox-Gall inspiss dry Powd. (Kip's)			
Oxone Cubes (Sod. peroxide fused for generating O	1.20		
Oxone Cartridges (Sod. peroxide fused for generating O)			Each .90
Oxydimethylquinizine see Antipyrine			
Oxyethylacetanilide see Acetphenetidin			
Oxymethylene see Formaldehyde			
Ozokerite see Ceresin Black			
Palladium Metal sheet and wire—Pd			
Palladium Praecipit. (Palladium Black)			
Palladium Chloride dry—$PdCl_2$			
Palladium Nitrate dry—$Pd(NO_3)_2$			
Pancreatin pure	4.45	.65	
Papain (Papayotin)	8.70	1.15	
Papers—Test see Test Papers			
Para-Amidoacetanilid see Acetphenylenediamine Para-			
Para-Amidophenol see Amidophenol Para-			
Para-Aminotoluene see Toluidine Para-			
Paradiaminodiphenyl see Benzidine			
Paradioxybenzene see Hydroquinone			
Paraffin Solid soft 43° M.P.	.50		
Paraffin Solid soft 48° to 50° M.P.	.50		
Paraffin Solid medium 52° to 54° M.P.	.50		
Paraffin Solid hard 56° to 58° M.P.	.50		
Paraffin Solid 60° to 62° M.P.	.50		
Paraffin Liquid see Oil Paraffin			
Paraformaldehyde (Trioxymethylene) $(CH_2O)_3$	1.70	.35	
Paraldehyde U.S.P.—$(CH_3.CHO)_3$	3.35	.50	
Paranaphthalene see Anthracene			
Paraphenylenediamine purified—$C_6H_4(NH_2)_2$	2.55	.50	
Paraphtalein see Phenolphtalein			
Parapropylmetacresol see Thymol			
Paris Green see Copper Acetoarsenite			

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Pear Oil see Amyl Acetate				
Pearl Ash see Potass. carbonate crude				
Pearl White see Bismuth Oxychloride				
Pelletierine Tannate	15 grm. 1.70			
Pentane (Amyl Hydride) from Petroleum—C_5H_{12}				
Pepsin Ph. G. powd.		6.25	.95	
Pepsin U.S.P. powd. or scales		11.70	1.25	
Pepton dry from **Albumen**			1.20	
Pepton dry from **meat**			1.00	
Pepton dry for Bact. work **"Difco"**		5.20	.80	
Perchloromethane see Carbon Tetrachloride				
Petroleum Ether see Ether Petrolic				
Petrolatum yellow		.40		
Petrolatum white		.60		
Phenacetin see Acetphenetidin				
Phenacetolin			1.80	
Phenanthrene—$(C_6H_4.CH)_2$				
Phenazone see Antipyrine				
Phenol see Acid Carbolic				
Phenolphtalein (indic.)—$C_{20}H_{14}O_4$			.90	
Phenyl Hydride see Benzol				
Phenyl Hydroxide see Acid Carbolic				
Phenyl Urethane see Euphorin				
Phenylacetic ester (ethyl)—$C_6H_5CH_2.CO_2H$.				
Phenylanime see aniline				
Phenylaniline see Diphenylamine				
Phenylhydrazine—$C_6H_5NH.NH_2$			2.10	
Phenylhydrazine, Base—$C_6H_5HN.NH_2$			1.70	
Phenylhydrazine Hydrochloride—$C_6H_8N_2.HCl$			1.50	
Phenylisocyanate				
Phenylmethane see Toluene				
Phenylmustard Oil see Oil Phenylmustard				
Phloroglucin (Phloroglucinol)—$C_6H_6O_3+2H_2O$				
Phospham c.p.				
Phosphoric Anhydride see Acid Phosphoric anhydride				
Phosphorus Yellow sticks—P		3.70	.55	
Phosphorus Yellow sticks thin $\frac{3}{16}$ in.		4.10		
Phosphorus Red amorph		3.60	.55	
Phosphorus Oxychloride—$POCl_3$		3.35	.50	
Phosphorus Pentachloride—PCl_5		2.65	.50	
Phosphorus Pentoxide see Acid Phosphoric anhydride				
Phosphorus Pentasulfide—P_2S_5			.80	
Phosphorus Trichloride—PCl_3		2.80	.50	
Phtalin- see Phenolphtalein				
Physostigmine and salts see Eserine				

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Pilocarpine Alkaloid—$C_{11}H_{16}N_2O_2$				
Pilocarpine Hydrobromide— $C_{11}H_{16}N_2O_2.HBr$	5 gr. 1.15			
Philocarpine Hydrochloride— $C_{11}H_{16}N_2O_2.HCl$	5 gr. 1.60			
Philocarpine Nitrate— $C_{11}H_{16}N_2O_2.HNO_3$	5 gr. 1.60			
Pilocarpine Salicylate— $C_{11}H_{16}N_2O_2.C_7H_6O_3$	5 gr. 1.15			
Pilocarpine Sulfate— $(C_{11}H_{16}N_2O_2)_2.H_2SO_4$	5 gr. 1.15			
Piperidine—$C_5H_{11}N$				
Piperine U.S.P.—$C_{17}H_{16}NO_3$				
Pitch Black		.35		
Pitch Burgundy		.65		
Plaster Paris see Calcium Sulfate calcined				
Platinum Asbestos 5% see Asbestos				
Platinum Black (Platin. Mohr)				
Platinum (ic) **Chloride** c.p. dry— $PtCl_4.2HCl+6H_2O$				
Platinum (ic) **Chloride** Solut. 5%				
Platinum (ic) **Chloride** Solut. 10%				
Platinum (ic) **Ammon. Chloride**— $PtCl_4.2NH_4Cl$				
Platinum (ic) **Barium Cyanide**— $Pt(CN)_2.Ba(CN)_2+4H_2O$				
Platinum (ous) **Barium Cyanide**— $Pt(CN)_2.Ba(CN)_2+4H_2O$				
Platinum (ous **Magnes Cyanide**— $Pt(CN)_2.Mg(CN)_2+7H_2O$				
Platinum (ic) **Potass. Chloride**— $PtCl_4.2KCl$				
Platinum (ous) **Potass. Chloride**— $PtCl_2 2KCl$				
Platinum (ous) **Potass. Cyanide**— $Pt(CN)_2.2KCN+3H_2O$				
Platinum (ous) **Sodium Chloride**— $PtCl_2.2NaCl+4H_2O$				
Podophyllin powder U.S.P.		7.50	1.15	
Potash Lye see Potassium Hydroxide Com'l				
Potassium Metal—K			6.50	
Potassium Acetate U.S.P.		2.40	.45	
Potassium Acetate c.p.—$KC_2H_3O_2$		3.30	.60	
Potassium Acetate c.p. Special anhyd.		3.75	.55	
Potassium Alum see Alumin Potass. Sulfate				
Potassium Ammon Sulfate c.p.— KNH_4SO_4		1.30	.25	
Potassium Antimoniate c.p.— $K_2H_2Sb_2O_7+6H_2O$		2.75	.45	
Potassium Arsenate c.p. secondary— K_2HASO_4		2.75	.50	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Potassium Arsenate c.p. tertiary— K_3AsO_4		3.00	.45	
Potassium Arsenite c.p.— $KAsO_2+H_3AsO_3$		2.90	.55	
Potassium Benzoate— $KC_7H_5O_2+3H_2O$			1.15	
Potassium Bicarbonate cryst. U.S.P.		1.50		
Potassium Bicarbonate c.p.— $KHCO_3$		4.00	.65	
Potassium Bichromate cryst. techn.		.95		
Potassium Bichromate powd. techn.		1.00	.20	
Potassium Bichromate c.p. crystals—$K_2Cr_2O_7$		1.70	.35	
Potassium Bichromate fused c.p.— $KHCrO_4$		1.90	.40	
Potassium Bifluoride c.p.—KHF_2		4.00	.60	
Potassium Binoxalate cryst.				
Potassium Binoxalate c.p.— $KHC_2O_4+H_2O$		3.05	.60	
Potassium Biphosphate (primary)— KH_2PO_4		2.85	.55	
Potassium Bisulfate cryst. c.p.— $KHSO_4$		1.80	.35	
Potassium Bisulfate fused c.p.		2.05	.40	
Potassium Bisulfite				
Potassium Bisulfite c.p.—$KHSO_3$		2.90	.55	
Potassium Bisulfite Meta- (Pyrosulfite) c.p.—$K_2S_2O_5$		2.90	.55	
Potassium Bitartrate crude (argols) powd.		1.70	.35	
Potassium Bitartrate powd. cp.— $KHC_4H_4O_6$		2.15	.45	
Potassium Bitartrate powd. (Cream Tartar) U.S.P.		1.40	.30	
Potassium Borate c.p.— $K_2B_4O_7+5H_2O$		2.50	.50	
Potassium Bromate c.p.—$KBrO_3$		4.75	.70	
Potassium Bromide cryst. or gran. U.S.P.		2.25	.45	
Potassium Bromide c.p.—KBr		3.70	.55	
Potassium Carbonate crude (Pearl Ash)				
Potassium Carbonate (Salt tartar)		2.00	.40	
Potassium Carbonate cryst. c.p.— K_2CO_3		3.05	.45	
Potassium Carbonate anhyd. c.p.		3.35	.50	
Potassium Chlorate cryst.		.90		
Potassium Chlorate gran.		1.20	.25	
Potassium Chlorate powd.		.95		
Potassium Chlorate small cryst. c.p.—$KClO_3$		1.95	.40	
Potassium Chlorate large cryst. c.p.		2.05	.40	
Potassium Chlorate powd. c.p.				
Potassium Chloride techn.				
Potassium Chloride pure		1.00	.20	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Potassium Chloride c.p.—KCl	1.25	.25
Potassium Chromate pure	1.95	.40
Potassium Chromate c.p.—K_2CrO_4	2.20	.45
Potassium Citrate U.S.P.	3.35	.50
Potassium Citrate c.p.—$K_2C_6H_5O_7+H_2O$	3.60	.50
Potassium Cyanate c.p.—KCNO		
Potassium Cyanide—KCN	.60	
Potassium Ferricyanide cryst.	4.85	.75
Potassium Ferricyanide cryst c.p.—$K_3Fe(CN)_6$	6.05	.90
Potassium Ferrocyanide cryst. pure	3.05	.45
Potassium Ferrocyanide anhydr. pure		
Potassium Ferrocyanide cryst c.p.—$K_4Fe(CN)_6+3H_2O$	3.30	.50
Potassium Fluoride c.p.—$KF+2H_2O$	4.30	.65
Potassium Fluoride fused c.p.	4.30	.65
Potassium Formate c.p.—$KCHO_2$	3.95	.60
Potassium Glycerophosphate—$C_3H_7O_3PO(OK)_2$	3.55	.55
Potassium Guaiacolsulfonate (Thiocol)—$C_6H_3.(OCH_3)OH.SO_3K$		
Potassium Hydroxide techn. lump (Lye)		
Potassium Hydroxide gran.	3.30	
Potassium Hydroxide Electrolytic sticks	5.50	.85
Potassium Hydroxide c.p. **by alcohol** sticks—KOH	8.50	1.20
Potassium Hydroxide by **Lime** sticks	7.50	1.10
Potassium Hydrosulfide c.p. (Bisulfide)—KSH	4.15	.60
Potassium Hypophosphite U.S.P.—KPH_2O_2	3.85	.60
Potassium Iodate c.p.—KJO_3		1.20
Potassium Iodide U.S.P.	5.60	.85
Potassium Iodide cryst. c.p.—KJ	6.85	1.05
Potassium Iodide c.p. Special—KJ	8.10	1.20
Potassium Mercuric Iodide c.p.—$KJHgJ_2$		1.25
Potassium Metabisulfite—$K_2S_2O_5$	2.75	.55
Potassium Molybdate c.p.—$K_2MoO_4+5H_2O$		1.20
Potassium Nitrate pure	1.35	.25
Potassium Nitrate pure powder	1.55	.30
Potassium Nitrate cryst. c.p.—KNO_3	1.65	.35
Potassium Nitrate powd. c.p.	1.80	.40
Potassium Nitrate fused, sticks c.p.	2.80	.55
Potassium Nitrate c.p. fused gran.—KNO_3	2.40	.50
Potassium Nitrite cryst.	3.15	.60
Potassium Nitrite cryst. cp.—KNO_2	3.35	.65
Potassium Nitrite sticks c.p.	3.60	.70

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Potassium Nitroprusside— $K_2Fe(CN)_5NO.2H_2O$		
Potassium Oxalate pure	2.70	.55
Potassium Oxalate c.p.—$K_2C_2O_4+H_2O$	3.30	.65
Potassium Oxalate anhydr. c.p.	3.40	.65
Potassium Oxalate acid see Pot. Binoxalate		
Potassium Perchlorate c.p.—$KClO_4$	5.20	.80
Potassium Permanganate pure	5.50	.85
Potassium Permanganate cryst. c.p. —$KMnO_4$	7.45	1.10
Potassium Persulfate—$K_2S_2O_8$	4.75	.75
Potassium Phosphate secondary c.p. —K_2HPO_4	3.60	.55
Potassium Phosphate primary c.p.— KH_2PO	3.45	.55
Potassium Phosphate tertiary c.p.— K_3PO_4	4.10	.65
Potassium Pyrophosphate c.p.— $K_4P_2O_7.3H_2O$	3.60	.55
Potassium Platinum Salts see Platinum		
Potassium Pyrosulfate see Pot. Bisulfate fused		
Potassium Pyrosulfite pure see Pot. Metabisulfite		
Potassium Salicylate pure—$KC_7H_5O_3$	3.90	.60
Potassium Silicate techn. lumps	1.80	.35
Potassium Silicate tech. solut. 30-33° Be (Potash Waterglass)— $K_2Si_4O_9$	1.10	.25
Potassium Silicate solut. c.p.	4.40	.70
Potassium Silicofluoride c.p.—K_2SiF_6	3.90	.60
Potassium Sulfate pure	.95	.25
Potassium Sulfate cryst. c.p.—K_2SO_4	1.10	.25
Potassium Sulfate powder c.p.	1.20	.25
Potassium Sulfate c.p. Special— K_2SO_4	1.80	.35
Potassium Sulfate c.p. Special powder	1.85	.35
Potassium Sulfate Acid see Pot. Bisulfate		
Potassium Sulfide fused pure	3.20	
Potassium Sulfide cryst. c.p.—K_2S	3.55	.55
Potassium Sulfite c.p.—$K_2SO_3+2H_2O$	3.30	.50
Potassium Sulfocarbolate— $C_6H_4(OH)SO_3K+H_2O$		.55
Potassium Sulfocyanate pure—KCNS		
Potassium Sulfocyanate c.p.—KCNS		
Potassium Tartrate powd. pure	2.25	.45
Potassium Tartrate cryst. c.p.— $2K_2C_4H_4O_6+H_2O$	3.20	.50
Potassium Tetroxalate c.p.— $KHC_2O_4.H_2C_2O_4+2H_2O$	3.10	.50
Potassium Thiocyanate see Pot. Sulfocyanate		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Potassium Zinc Sulfate c.p.— $K_2SO_4ZnSO_4$	2.00	.40
Propylamine see Trimethylamine		
Protocatechin Methyl Ester see Guaiacol		
Prussian Blue see Iron Ferrocyanide		
Pumice lump	.30	
Pumice powd.	.20	
Pyridine medicinal	4.75	.70
Pyroacetic Ether see Acetone		
Pyrocatechin resubl. (Orthodioxybenzene) $C_6H_4(OH)_2$		
Pyrocatechinmonoethyl Ester see Guaethol		
Pyrocatechinmonomethyl Ester see Guaiacol		
Pyrogallol see Acid Pyrogallic		
Pyrogallol Monoacetate see Eugallol		
Pyrogallol Triacetate see Lenigallol		
Pyrolusite see Mangan. Peroxide nat.		

QUININE SALTS ARE NOT STOCKED

Quercit (Acorn Sugar)—$C_6H_7(OH)_5$		
Quinidine Alkaloid cryst.— $C_{20}H_{24}N_2O_2+2\frac{1}{2}H_2O$		
Quinidine Alkaloid Precip.		
Quinidine Sulfate— $(C_{20}H_{24}N_2O_2)_2.H_2SO_4+2H_2O$		
Quinine Alkaloid pure— $C_{29}H_{24}N_2O_2+3H_2O$		
Quinine Acetate— $C_{20}H_{24}N_2O_2.C_2H_4O_2$		
Quinine Arsenate— $2(C_{20}H_{24}N_2O_2).H_3AsO_4+8H_2O$		
Quinine Arsenite	2.85	
Quinine Bisulfate— $C_{20}H_{24}N_2O_2.H_2SO_4+7H_2O$	2.00	
Quinine Carbonic Ether see Euquinine		
Quinine Citrate— $(C_{20}H_{24}N_2O_2)_2.C_6H_8O_7+7H_2O$	2.60	
Quinine Dihydrochloride— $C_{20}H_{24}N_2O_2.2HCl+2H_2O$	2.85	
Quinine Ethyl Carbonate see Euquinine		
Quinine Ferrocyanide— $C_{20}H_{24}N_2O_2.H_4Fe(CN)_6+3H_2O$	2.70	
Quinine Glycerophosphate— $C_3H_7O_3.PO_3.C_{29}H_{24}N_2O_2)_2$	3.40	
Quinine Hydriodide—$C_{20}H_{24}N_2O_2.HJ$	3.10	
Quinine Hydrobromide— $C_{20}H_{24}N_2O_2.HBr+H_2O$	2.40	
Quinine Hydrochloride— $C_{20}H_{24}N_2O_2.HCl+2H_2O$	2.40	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Quinine Hypophosphite $C_{20}H_{24}N_2O_2.HPH_2O_2$		2.70
Quinine Lactate— $C_{20}H_{24}N_2O_2.C_3H_6O_3$		2.70
Quinine Phosphate— $(C_{20}H_{24}N_2O_2)_2.H_3PO_4+8H_2O$		2.50
Quinine Salicylate— $2(C_{20}H_{24}N_2O_2).C_7H_6O_3$		2.40
Quinine Sulfate— $(C_{20}H_{24}N_2O_2)_2.H_2SO_4+7H_2O$		2.25
Quinine Tartrate— $(C_{20}H_{24}N_2O_2).C_4H_6O_6+H_2O$		2.40
Quinine Valerianate— $C_{20}H_{24}N_2O_2.C_5H_{10}O_2+H_2O$		5.20
Quinine and **Urea Hydrochloride—** $C_{20}H_{24}N_2O_2.HCl+CO(NH_2)_2.HCl+5H_2O$		3.00
Quinoidine		
Quinol see Hydroquinone		
Quinoline pure—C_9H_7N		
Quinoline Tartrate— $(C_9H_7N)_3.(C_4H_6O_6)_4$		
Quinone (Benzoquinone)—$C_6H_4O_2$		
Radium, pure element—Ra		
Radium, salts in all activities		
Realgar see Arsenic Sulfide Red		
Red Lead see Lead Oxide		
Red Praecipitate see Mercury (ic) Oxide		
Resorcin recryst. (Resorcinol)— $C_6H_6O_2$		1.15
Resorcin resubl		1.15
Resorcinol Monoacetate see Euresol		
Resorcinolphtalein see Fluorescein		
Resorcinolphtalin see Fluorescin		
Retinol—$C_{32}H_{16}$		1.20
Rochelle Salt see Sod. and Potass. Tartrate		
Rock Salt	.15	
Rosaniline HCL-P— $C_{29}H_{19}N_3HCl+4H_2O$	6.30	.95
Rosin Yellow (Colophony)		
Rosin Yellow powder	.40	
Rosin white	.40	
Rouge- Jewellers		
Saccharin—$C_6H_4(CO).SO_2.NH$		2.40
Saccharose c.p.—$C_{12}H_{22}O_{11}$	1.80	.40
Salicin U.S.P.—$C_{13}H_{18}O_7$		3.65
Salicylic Aldehyde (Acid Salicylous) —$C_6H_4.OH.COH$		
Salol (Phenyl Salicylate)—$C_{13}H_{10}O_3$	3.10	.40
Salt Best	.15	
Salt Schlippe's see Sod. Thioantimoniate		
Salt Sorrel see Pot. Binoxalate		
Salt Tartar see Pot. Carbonate		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.
Saltcake see Sod. Bisulfate techn.			
Saltpetre see Pot. Nitrate			
Sand, Quarz, washed and ignited		.40	
Sand, Sea		.15	
Sand, Sea, washed and ignited		.40	
Sand, Silica, powdered		.30	
Santonin cryst—$C_{15}H_{18}O_3$			5.20
Saponin crude			
Schlippe's Salt see Sod. Thioantimoniate			
Sealing Wax see Wax			
Seignette Salt see Sod. Pot. Tartrate			
Selenium powd.—Se			
Selenium sticks			
Shellac Orange flake			
Shellac Orange powd.			
Shellac White			
Silica powd. see Sand			
Silver Metal, gran.—Ag			
Silver Metal, foil and wire			
Silver Metal, ppt.			3.00
Silver Metal, leaf	Book, .30		
Silver Acetate c.p.—$AgC_2H_3O_2$			3.50
Silver Arsenite c.p.—Ag_3AsO_3			3.50
Silver Bromide—AgBr			1.90
Silver Carbonate c.p.—Ag_2CO_3			2.10
Silver Chloride pure—AgCl			2.00
Silver Chromate pure—Ag_2CrO_4			2.00
Silver Citrate pure—$Ag_3C_6H_5O_7$			2.30
Silver Cyanide pure—AgCN			
Silver Iodide pure—AgJ			2.00
Silver Lactate—$AgC_3H_5O_3+H_2O$			3.10
Silver Nitrate cryst. c.p.—$AgNO_3$		13.00	1.20
Silver Nitrite c.p.—$AgNO_2$			7.80
Silver Oxide pure—Ag_2O			2.40
Silver Phosphate pure—Ag_3PO_4			3.60
Silver Sulfate c.p.—Ag_2SO_4			3.10
Silver Sulfate c.p. Special			
Slag Wool see Mineral Wool			
Soap Castile white bars		.55	
Soap Castile white powd.		1.25	
Soap Soft (Green Soap) U.S.P.			
Soda Ash see Sodium Carbonate			
Soda Lime see Sodium Calc. Hydrate			
Soda Lye see Sodium Hydroxide			
Sodium Metal—Na		2.90	.60
Sodium Acetate cryst.		.70	
Sodium Acetate cryst. c.p.—$NaC_2H_3O_2+3H_2O$		1.00	.20
Sodium Acetate anhydr. c.p.		1.30	.25
Sodium Acetate fused c.p. crystals		1.25	.25
Sodium Alum see Alumin. Sod. sulfate			
Sodium Aluminate c.p.—$Na_2Al_2O_4$		2.30	.45
Sodium Aluminum Fluoride pure—$NaFAl_2F_6$		.90	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Sodium Amalgam 5% 10% or 15%		1.00
Sodium Ammon. Phosphate pure	.85	
Sodium Ammon. Phosphate c.p.— $Na(NH_4)HPO_4+4H_2O$	.95	
Sodium Arsenate techn. lumps	.70	
Sodium Arsenate c.p.— $Na_2HAsO_4+7H_2O$	1.00	.20
Sodium Arsenate anhydr. c.p.— Na_2HAsO_4	1.45	.30
Sodium Arsenite techn.	.60	
Sodium Arsenite c.p.—$NaAsO_2$	1.20	.25
Sodium Benzene Sulfonate— $NaC_6H_5SO_3$	7.00	1.05
Sodium Benzoate—$NaC_7H_5O_2+H_2O$		
Sodium Bicarbonate powd. c.p.	.45	
Sodium Bicarbonate pure—$NaHCO_3$	.40	
Sodium Bicarbonate c.p.	.50	
Sodium Bichromate techn.	.70	
Sodium Bichromate dry powd. c.p.	1.80	.40
Sodium Bichromate cryst. c.p.— $Na_2Cr_2O_7+Aq$	1.30	.30
Sodium Binoxalate c.p.—$NaHC_2O_4$	1.70	.35
Sodium Bismuthate c.p.	11.25	1.75
Sodium Bisulfate powd.		
Sodium Bisulfate cryst c.p.— $NaHSO_4+H_2O$	.50	
Sodium Bisulfate powd. c.p. (Pyro)	.85	
Sodium Bisulfide c.p.	.55	
Sodium Bisulfite dry pure	.60	
Sodium Bisulfite purified—$NaHSO_3$	.95	
Sodium Bisulfite sol. c.p.		
Sodium Bitartrate c.p.— $NaHC_4H_4O_6+H_2O$	2.15	.45
Sodium Borate (Borax)	.35	
Sodium Borate cryst. c.p.— $Na_2B_4O_7+10H_2O$	.60	
Sodium Borate powd. c.p.	.70	
Sodium Borate anhydr. powd. c.p.	1.30	.30
Sodium Borate fused ground (Borax Glass)	.55	
Sodium Bromate c.p.—$NaBrO_3$	3.40	.55
Sodium Bromide c.p.—NaBr	2.20	.45
Sodium Calcium Hydrate, dry for N. Det. 2% moisture 4-8-12-20-40-60 mesh—(Soda Lime	.70	
Sodium Calcium Hydrate for CO_2 Det. Special 4-8-12 mesh 2% moisture—$NaOHCa(OH)_2$	1.10	.20
Sodium Calcium Hydrate for CO_2 Det. 2% moisture 4-8-12 mesh —(Soda Lime)	.60	
Sodium Calcium Hydrate 15% H_2O for CO_2 Det. 4-8-12 mesh— (Soda Lime)	.90	
Sodium Carbonate cryst. techn. (Sal Soda)	.10	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Sodium Carbonate calcined (Soda Ash)	.15	
Sodium Carbonate pure anhydrous	.60	
Sodium Carbonate anhydr. c.p.—Na_2CO_3	.70	
Sodium Carbonate anhydr. c.p. special	1.45	.30
Sodium Carbonate cryst. c.p.—$Na_2CO_3+10H_2O$	.60	
Sodium Carbonate monohydrated U.S.P.—$Na_2CO_3+H_2O$	.30	
Sodium Chlorate pure	1.10	.25
Sodium Chlorate cryst. c.p.—$NaClo_3$	1.35	.30
Sodium Chloride techn.	.15	
Sodium Chloride cryst. c.p.—NaCl	.70	
Sodium Chloride cryst. c.p. special	1.30	.30
Sodium Chloride fused c.p.	1.05	.20
Sodium Choleate	6.00	.90
Sodium Chromate acid see Sod. Bichromate		
Sodium Chromate c.p.—$Na_2CrO_4+10H_2O$	1.80	.35
Sodium Chromate c.p. fused	2.70	.55
Sodium Cinnamate—$NaC_9H_7O_2$		1.60
Sodium Citrate pure	1.20	.25
Sodium Citrate c.p.—$2Na_3C_6H_5O_7+11H_2O$	2.00	.40
Sodium Cobaltic Nitrite c.p.		1.00
Sodium Dioxide see Sod. Peroxide		
Sodium Ethylate dry—C_2H_5ONa		1.20
Sodium Ethylate liquid		.60
Sodium Ferrocyanide c.p.—$Na_4Fe(CN)_6+12H_2O$	3.10	.45
Sodium Fluoride techn. powd.	.50	
Sodium Fluoride c.p.—NaF	1.05	.20
Sodium Formate c.p.—$NaCHO+H_2O$	2.30	.45
Sodium Glycerophosphate 75% solution—$Na_2C_3H_7PO_6+Aq$	3.60	.55
Sodium Glycocholate—$NaC_{26}H_{42}NO_6$		1.15
Sodium Hydroxide 98% gran.	.30	
Sodium Hydroxide electrolyt. sticks	.80	
Sodium Hydroxide gran. pure	.45	
Sodium Hydroxide by lime sticks	1.10	.25
Sodium Hydroxide by **alcohol** c.p. sticks—NaOH	1.60	.35
Sodium Hydroxide from Sodium c.p.		
Sodium Hydroxide with Lime (see Sodium Calcium Hydrate)		
Sodium Hypochlorite solut.—NaOCl	.30	
Sodium Hypophosphite—$NaH_2NO_2+H_2O$	2.05	.40
Sodium Hyposulfite see Sod. Thiosulfate		
Sodium Iodate c.p.—$NaJO_3$		1.30
Sodium Iodide c.p.—NaJ		1.15
Sodium Lactate liquid—$NaC_3H_5O_3$	5.85	.75

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Sodium Lactophosphate		3.90	.60	
Soda Lime see Sod. Calcium Hydrate				
Sodium Metaphosphate c.p.—$NaPO_3$		2.10	.45	
Sodium Molybdate c.p.— $Na_2MoO_4+2H_2O$		6.00	.90	
Sodium Monosulfide see Sod. Sulfide cryst.				
Sodium Nitrate pure		.50		
Sodium Nitrate cryst. c.p.—$NaNO_3$		.65		
Sodium Nitrate powd. cp		.60		
Sodium Nitrate c.p. Special		.65		
Sodium Nitrate c.p. sticks		2.20	.45	
Sodium Nitrite techn		.95		
Sodium Nitrite cryst. c.p.—$NaNO_2$		1.65	.35	
Sodium Nitrite sticks c.p.		1.75	.35	
Sodium Nitroprusside— $Na_2Fe(CN)_5(NO)+2H_2O$			1.25	
Sodium Oleate—$NaC_{18}H_{33}O_2$		1.30	.25	
Sodium Oxalate				
Sodium Oxalate c.p.—$Na_2C_2O_4$		1.85	.35	
Sodium Oxalate c.p. special	¼ lb. 1.50			
Sodium Perborate c.p.— $NaBO_3+4H_2O$		2.20	.45	
Sodium Permanganate 30% sol.— $NaMnO_4$		1.35	.25	
Sodium Peroxide	¼ lb. .75	1.60		
Sodium Peroxide carbonate free— Na_2O_2	¼ lb. 1.50	3.50		
Sodium Peroxide fused		3.30		
Sodium Phenolsulfonate U.S.P.— $C_6H_4OH.SO_2ONa+2H_2O$		1.50	.30	
Sodium Phosphate secondary cryst. pure		.65		
Sodium Phosphate secondary c.p.— $Na_2HPO_4+12H_2O$		.75		
Sodium Phosphate secondary anhydr. c.p.		1.15	.30	
Sodium Phosphate secondary anhyd. pure		.80		
Sodium Phosphate c.p. secondary special		1.00	.20	
Sodium Phosphate primary c.p.— $NaH_2PO_4+H_2O$		1.30	.30	
Sodium Phosphate c.p. primary dry		1.80	.35	
Sodium Phosphate tertiary c.p.— $Na_3PO_4+12H_2O$		1.45	.30	
Sodium Phosphate c.p. **Meta**— $Na_4P_4O_{12}$		2.05	.40	
Sodium Phosphite c.p.— $Na_2HPO_3+5H_2O$			.75	
Sodium Picrate		3.20	.50	
Sodium Potass. Carbonate c.p.— $NaKCO_3.6H_2O$		1.10	.25	
Sodium Potass. Nitrate c.p.— $NaK(NO_3)_2$		1.30	.25	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.	
Sodium Potass. Phosphate c.p.— $NaKHPO_4+7H_2O$	1.30	.25	
Sodium Potass. Sulfate c.p.— $Na_2SO_4.3K_2SO_4$	1.05	.20	
Sodium Potass. Tartrate powd. c.p. —$NaKC_4H_4O_6.4H_2O$	1.15	.25	
Sodium Potass. Tartrate pure powd.	1.10	.20	
Sodium Potass. Tartrate cryst. c.p.	1.50	.30	
Sodium Potass. Tartrate c.p. large crystals	1.55	.30	
Sodium Pyroborate see Sod. Borate, Borax			
Sodium Pyrophosphate cryst. c.p.— $Na_4P_2O_7+10H_2O$	1.15	.25	
Sodium Pyrophosphate pure crystals	.70		
Sodium Pyrophosphate dry c.p.— $Na_4P_2O_7$	1.90	.40	
Sodium Salicylate U.S.P.	1.80	.40	
Sodium Salicylate c.p.—$NaC_7H_5O_3$			
Sodium Salicylate FR nat. Oil Wintergreen—$C_6H_4(OH)COONa$		1.15	
Sodium Santoninate— $NaC_{15}H_{19}O_4+3\frac{1}{2}H_2O$			
Sodium Selenite—Na_2SeO_3		1.20	
Sodium Silicate techn. solut. 40-42° Be (Soda Waterglass)	.10		Gal. .75
Sodium Silicate cryst. c.p.— Na_2SiO_3+Aq			
Sodium Silicate pure 40% solut.	.30		
Sodium Silicofluoride c.p.—Na_2SiF_6	1.90	.40	
Sodium Stannate c.p.— $Na_2SnO_3+3H_2O$	2.00	.40	
Sodium Stearate—$NaC_{18}H_{35}O_2$	1.10	.20	
Sodium Succinate—$Na_2C_4H_4O_4+6H_2O$		1.40	
Sodium Sulfate techn. cryst.	.20		
Sodium Sulfate purif. cryst.	.35		
Sodium Sulfate cryst. c.p.— $Na_2SO_4+10H_2O$	.50		
Sodium Sulfate purif. dry powd.	.25		
Sodium Sulfate anhydr. c.p.	.65		
Sodium Sulfide cryst. c.p— Na_2S+9H_2O	.90		
Sodium Sulfide fused	.80		
Sodium Sulfite cryst. pure	.30		
Sodium Sulfite cryst. c.p.— $Na_2SO_3+7H_2O$	.55		
Sodium Sulfite dry pure	.50		
Sodium Sulfite anhydr. c.p.	.55		
Sodium Sulfocarbolate see Sodium Phenolsulphonate			
Sodium Sulfocyanate see Sodium Thiocyanate			
Sodium Tannate—$NaC_{14}H_9O_9$		.50	
Sodium Tartrate c.p.— $Na_2C_4H_4O_6+2H_2O$	1.45	.30	
Sodium Tartrate pure	1.05	.20	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Sodium Taurocholate—$NaC_{26}H_{44}NSO_7$		2.10
Sodium Tetraborate see Sod. Borate (Borax)		
Sodium Tetroxalate c.p.	3.50	.55
Sodium Thioantimoniate c.p. (Schlipp's Salt)—$Na_3SbS_4.9H_2O$	1.80	.35
Sodium Thiocyanate	5.40	.80
Sodium Thiosulfate cryst. techn.	.15	
Sodium Thiosulfate dry pure	.35	
Sodium Thiosulfate cryst. c.p.—$Na_2S_2O_3+5H_2O$	.45	.30
Sodium Thiosulfate c.p. crystals Special—$Na_2S_2O_3.5H_2O$	.80	
Sodium Thiosulfate pure crystals	.30	
Sodium Thiosulfate anhydr. c.p.	.85	
Sodium Tungstate pure	7.75	1.15
Sodium Tungstate c.p.—$Na_2Wo_4+2H_2O$	8.60	1.30
Sodium Valerate—$NaC_5H_9O_2$		
Sodium Wolframate see Sod. Tungstate		

SOLUTIONS

Solution Acid Phosphomolydic 10%	2.30	.45
Solution acid Phosphotungstic 10%	2.40	.50
Solution Ammon. Bisulfite c.p.	1.10	
Solution Ammon. Molybdate	2.15	
Solution Ammon. Nitrite	1.00	
Solution Ammon. Sulfhydrate		
Solution Barium Hydroxide T.S.		
Solution Bromine T.S.		
Solution Calcium Bisulfite c.p.	.60	
Solution Calcium Chloride T.S.		
Solution Calcium Hydrate T.S.		
Solution Chlorine T.S.		
Solution Chromium Ammon. Sulfate c.p.	1.80	
Solution Chromium Chloride 50% c.p.	1.35	
Solution Chromium Nitrate 40% c.p.	1.75	
Solution Chromium Sulfate 30% c.p.	1.40	
Solution Cobalt Nitrate T.S.		
Solution Cochineal T.S.		
Solution Copper (ous) **Chloride** acid		
Solution Gas, for Analysis with Orsat Apparatus		
No. 1 Potassium Hydroxide Solution for absorbing CO_2	7.00	1.00
No. 2 Ammoniacal Solution Cuprous Chloride for absorbing CO	4.20	.75
No. 3 Potassium Pyrogallate Solution for absorbing O	7.00	1.00
Solution Hydrogen Sulfide		
Solution Indigo T.S.		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Solution Iodine T.S.		
Solution Iron Acetate (ous)		
Solution Iron (ic) **Chloride**	.60	
Solution Iron (ic) **Sulfate** normal		
Solution Lacmoid indicator		
Solution Lead Acetate basic T.S.	.70	
Solution Litmus indicator	2.80	.55
Solution Magnesia Mixture T.S.		
Solution Mercury (ic) **Chloride** alcoholic T.S.		
Solution Mercury (ous) **Nitrate** T.S.		
Solution Methyl Orange	1.10	.50
Solution Orcein		
Solution Phenolphtalein T.S.		
Solution Platinic Chloride 5%		
Solution Platinic Chloride 10%		
Solution Potassium Acetate		
Solution Resorcin		
Solution Soap for Water Analysis		
Solution Sodium Bisulfite 30° Be		
Solution Sodium Cobaltic Nitrite T.S.		
Solution Sodium Silicate 40-42° Be Com'l	.10	
Solution Sodium Silicate 40% pure	.30	
Solution Sodium Thiosulfate 1/10 N		
Solution Tin (ous) **Chloride** T.S.		
Solution Tumeric indicator		
Solution Zinc Chloride c.p.		
Solution Zinc Iodide Starch		

SOLUTIONS—Special Test

Solution Benedict's A 1st Method	5.00	.75
Solution Benedict's B 1st Method	5.00	.75
Solution Benedict's C 1st Method	5.00	.75
Solution Benedict's D 1st Method	5.00	.75
Solution Benedict's, Sugar, 2nd Method Quant.	5.00	.75
Solution Boas' for detection of HCL in gastric juice		
Solution Congo Red for detection of free HCL in stomach		
Solution Dimethylamido-azo-benzol 0.5% for gastric juice analysis (Toepfer)		
Solution Doremus for estimating amount of Urea in Urine	1.50	.50
Solution Dunger's Diluting		
Solution Ehrlich's (Diazo Reaction)		
Solution Esbach's, Albumen	1.20	.50
Solution Fehling's, Sugar	2.00	.50
Solution Fehling's Alkaline	2.00	.50
Solution Fehling's Copper	2.00	.50
Solution Gram's Iodine	1.10	.50
Solution Gunzberg's, HCl in gastric juice		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Solution Haine's, Glucose	3.00	.55
Solution Hammarsten's		
Solution Hayem's, Blood	1.50	.50
Solution Hypobromite Hufner's No. 1		
Solution Hypobromite Hufner's No. 2		
Solution Lugol's	7.00	1.00
Solution Mayer's, Alkaloids		
Solution Millon's, Albumen		
Solution Nessler's, Ammonia and Aldehyde	15.00	2.00
Solution Nylander's, Glucose	3.25	.55
Solution Obermayer's	2.00	.50
Solution Phloroglucin-Vanillin for detection of HCl in gastric juice		
Solution Physiological Salt see Sod. Chloride 1/10 N Solut.		
Solution Schuchardt's HCl in gastric juice		
Schweizer's, Cellulose		
Solution Toepfer's, HCl in gastric juice	5.00	.70
Solution Toison's, Blood	3.00	.55
Solution Tropaeolin 00 for detection of HCl in gastric juice		
Solution Tsuchiya's		
Solution Zenker's		

SOLUTIONS—Standard Volumetric

Acid Hydrochloric 1/10 N	1.50	
Acid Hydrochloric Normal	1.50	
Acid Hydrochloric 1/50 N	1.50	
Acid Nitric 1/10 N	1.50	
Acid Nitric Normal	1.50	
Acid Nitric 1/50 N	1.50	
Solution Acid Oxalic 1/10 N	1.50	
Acid Sulfuric 1/10 Normal	1.50	
Acid Sulfuric Normal	1.50	
Acid Sulfuric 1/50 N	1.50	
Ammon. Hydrate 1/10 N	1.50	
Solution Ammon. Thiocyanate 1/10 N	1.50	
Solution Arsenous Trioxide 1/10 N	1.50	
Solution Iodine 1/10 N	1.50	
Solution Potass. Bichromate 1/10 N	1.50	
Solution Potass. Hydrate 1/10 N	2.00	
Solution Potassium Hydrate Normal	2.00	
Solution Potassium Hydrate 1/50 N	2.00	
Solution Potass. Permanganate 1/10 N.	2.00	
Solution Silver Nitrate 1/10 N	2.00	
Solution Sodium Carbonate 1/10 N	1.50	
Solution Sodium Carbonate Normal	1.50	
Solution Sodium Carbonate 1/50 N	1.50	
Solution Sodium Chloride 1/10 N	1.50	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Solution Sodium Hydrate 1/10 N		1.50		
Solution Sodium Hydrate Normal		1.50		
Solution Sodium Hydrate 1/50 N		1.50		
Sparteine Sulfate U.S.P.— $C_{15}H_{26}N_2.H_2SO_4+5H_2O$				

STAINS, BIOLOGICAL—Dry

	1 Grm.	5 Grm.	10 Grm.	25 Grm.	100 Grm.
Alizarin-Lake	$	$	$ .55	$ 1.10	$ 3.85
Alkalie Blue			1.20	2.55	
Aniline Blue			.95	2.00	
Azur I—Giemsa	1.45	5.80	9.75		
Azur II—Giemsa	1.35	5.40	8.75		
Azur II Eosin—Giemsa	1.70	6.80	12.25		
Auramine			.50	1.25	
Bismarck Brown			.45	.90	3.15
Bitter Almond Green			.70	1.85	
Brilliant Green			.80	1.60	5.00
Carmine, pure			.45	1.10	
Chrysoidine			.45	1.10	
Congo Red			.45	.90	3.15
Coralline			1.40	3.20	
Crystal Violet			.80	1.60	5.60
Dahlia Violet 2R			7.00		
Dahlia Violet 2B			6.00		
Diamond Fuchsine			.75	1.70	
Eosin, soluble in water			.55	1.10	3.85
Eosin, soluble in alcohol			.55	1.10	3.85
Eosine, Bluish			1.20	2.55	
Eosine—Methylene Blue (Jenner)			1.25	2.75	
Erythrosin			1.00	2.00	7.00
Fluorescein			.70	1.50	
Fuchsin, Basic, for Bacilli			.60	1.20	4.20
Fuchsin, Acid			.60	1.20	4.20
Gentian Violet			.50	1.00	3.50
Haematoxylin, pure crystals			.80	1.60	5.60
Haematoxyline, dark			.30	.65	
Hasting Stain			12.00		
Helianthine			.55	1.25	
Hexamethylviolet			.75	1.70	
Iodine Eosine			1.55	3.45	
Jenner's Dry Stain	.25	.80	1.20	2.40	8.40
Lacmoid C. P. Scales			2.05	4.75	
Leishman Stain			6.00		
Malachite Green, crystals			.90	1.80	6.30
Malachite Green (powder)			.85	1.85	
Metanil Yellow			.40	1.00	
Methyl Green			2.00		
Methyl Red			5.00	12.50	
Methyl Violet B			.55	1.10	3.85
Methyl Violet 2 B			.65	1.30	4.55
Methyl Violet 6 B			.65	1.30	4.55
Methylene Blue, Bact. for Bacili			.50	1.00	3.50
Methylene Blue, medicinal pure			1.00	2.00	7.00

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

STAINS, BIOLOGICAL—Dry

	1 Grm.	5 Grm.	10 Grm.	25 Grm.	100 Grm.
Methylene Blue B.X.	.....	.....	.60	1.20	4.20
Methylene Blue (Rectified for Wright Stain)	.....	.....	1.55	3.45	.....
Methylene Green	.....	.....	1.55	3.45	.....
Methyl Orange—Indicator	.....	.....	.60	1.20	4.20
Naphthol Green B	.....	.....	.70	1.50	.....
Naphthol Yellow	.....	.....	.50	1.25	.....
Neutral Red	.25	1.00	1.50	3.00	10.50
Nigrosine, Bluish, soluble in water	.....	.....	.50	1.00	3.50
Orange G	.....	.....	.60	1.20	4.20
Pheno-Safranine	.....	.....	.80	1.75	.....
Purpurine X	.....	.....	7.20	.....	.....
Romanowsky Stain	.....	.....	6.00	.....	.....
Rosaniline Hydrochloride	.....	.....	.75	1.70	.....
Safranin, soluble in water	.....	.....	.60	1.20	4.20
Scarlet Red	.....	.....	.90	1.80	6.30
Sudan III	.....	.....	.80	1.60	5.60
Thionin	.25	.80	1.40	2.80	9.80
Toluidine Blue	.....	.....	.95	2.10	.....
Victoria Green	.....	.....	.90	1.80	6.30
Wright's Dry Stain	.35	1.40	2.50	5.00	17.50

STAINS, BIOLOGICAL—Solution

	Ounce
Alum Carmine	$ .25
Alum Haematoxylin	.25
Basic Fuchsine (Sat. Alcoholic)	.75
Basic Fuchsine (Sat. Aqueous)	.35
Bismarck Brown	.25
Borax Carmine	.25
Carbol Fuchsin, Gabbett's	.25
Carbol Fuchsin, Ziehl-Neelsen	.25
Carmine Neutral	.25
Congo Red	.35
Delafield's Haematoxylin Solution	.25
Eosin, I. p. c., Alcoholic	.25
Eosin, I. p. c., Aqueous	.25
Eosinated Methylene Blue, Jenner's	.50
Eosinated Methylene Blue, Hasting's	.50
Eosinated Methylene Blue, Wright's	.50
Ehrlich's Tri-Acid	.50
Erythrosine	.50
Gabbett's Carbol Fuchsin	.25
Gentian Violet (Ehrlich)	.50
Giemsa's Spirochaete	1.00
Gabbett's Acid Methylene Blue	.25
Gram's Gentian Violet	.25
Gram's Solution of Iodine	.20
Gentian Violet, 1 p. c., Aqueous	.25
Gentian Violet, 2 p. c., Alcoholic	.25
Gentian Violet, Gram's	.25
Goldhorn's Polychrome Methylene Blue	.40
Haematoxylin Solution, Delafield's	.25

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

STAINS, BIOLOGICAL—Solution

	Ounce
Hasting's Eosinated Methylene Blue	.50
Jenner's Eosinated Methylene Blue	.50
Krauss-Giemsa, Two Solution	1.25
Leishman Stain	2.75
Loeffler's Methylene Blue	.25
Methylene Blue (Sat. Alc.)	.75
Methylene Blue, Acid, Gabbett's	.25
Methylene Blue, Loeffler's	.25
Neisser Stain	1.30
Neusser Stain	1.30
Picro Carmine	.25
Polychrome Methylene Blue, Goldhorn's	.40
Romanowsky Stain	2.75
Safranine	.50
Solution of Iodine, Gram's	.20
Solution, Toison's	.15
Spirochaete, Giemsa's	1.00
Tiedeman Stain	1.00
Toison's Solution	.15
Toluidine Blue	.75
Tri-Acid, Ehrlich's	.50
Unna Polychrome Methylene Blue	1.25
Wright's Eosinated Methylene Blue	.50
Ziehl-Neelsen Carbol Fuchsin	.25

Name and Formula.	Lb.	Oz.	
Stannic and Stanneous Salts see Tin			
Starch, Arrow-Root	.70		
Starch, Corn	.35		
Starch, Potato	.70		
Starch, Rice			
Starch, Wheat	.70		
Starch, Iodized		.50	
Starch, Soluble tech.	.70		
Starch, Soluble, according to Lintner	1.20	.25	
Starch, Soluble, c.p. Completely soluble at 70° C.	1.50	.30	
Starch, Soluble, c.p. Special Cold Water Soluble—$(C_6H_{10}O_5)x$	2.70	.55	
Starch Sugar see Dextrose			
Stearin—$(C_{18}H_{35}O_2)_3C_3H_5$	.80		
Strontium Acetate c.p.—$Sr(C_2H_3O_2)_2+\frac{1}{2}H_2O$	2.75	.55	
Strontium Arsenite—$Sr(AsO)_2.4H_2O$	4.40	.65	
Strontium Borate c.p.—$SrB_4O_7.4H_2O$	2.45	.50	
Strontium Bromate—$Sr(BrO_3)_2.H_2O$	.95		
Strontium Bromide c.p.—$SrBr_2$	2.05	.40	
Strontium Bromide cryst.—$SrBr_2+6H_2O$	1.45	.30	
Strontium Bromide anhydr. pure—$SrBr_2$	2.00	.40	
Strontium Carbonate pure	1.05	.20	
Strontium Carbonate c.p.—$SrCO_3$	1.20	.25	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.	
Strontium Carbonate c.p. Special Barium free—$SrCO_3$	1.35	.25	
Strontium Chloride pure	.85		
Strontium Chloride c.p.—$SrCl_2+6H_2O$	1.10	.25	
Strontium Chloride c.p. Special—$SrCl_2Sr(CHO_2)_2.2H_2O$	1.30	.25	
Strontium Chromate c.p.—$SrCrO_4$	3.15	.45	
Strontium Fluoride c.p.—SrF_2	2.00	.40	
Strontium Formate—$Sr(CHO_2)_2.2H_2O$	2.25	.45	
Strontium Hydroxide c.p.—$Sr(OH)_2+8H_2O$	2.25	.45	
Strontium Iodide c.p.—SrJ_2+6H_2O		1.25	
Strontium Lactate—$Sr(C_3H_5O_3)_2+3H_2O$	3.65	.55	
Strontium Manganate c.p.—$SrMnO_4$	2.70	.55	
Strontium Molybdate c.p.—$SrMoO_4$	5.35	.80	
Strontium Nitrate pure	.85		
Strontium Nitrate c.p.—$Sr(NO_3)_2$	1.20	.25	
Strontium Nitrate c.p. Special—$Sr(NO_3)_2$	1.50	.30	
Strontium Oxalate	2.75	.55	
Strontium Oxalate c.p.—SrC_2O_4	2.85	.60	
Strontium Oxide c.p. **Hydrated**—SrO	2.55	.50	
Strontium Perborate c.p.—$Sr(B_4O_7)_2$	2.45	.50	
Strontium Peroxide—SrO_2	2.45	.50	
Strontium Phosphate c.p.—$Sr_3(PO_2)_2$	2.20	.45	
Strontium Salicylate U.S.P.—$Sr(C_7H_5O_3)_2+2H_2O$	1.80	.35	
Strontium Sulfate com'l	.70		
Strontium Sulfate c.p.—$SrSO_4$	1.10	.25	
Strontium Sulfide c.p.—SrS	2.55	.55	
Strontium Tartrate c.p.—$SrC_4H_4O_6.4H_2O$	4.25	.65	
Succrose see Saccharose			
Sugar, Acorn see Quercit			
Sugar, Cane see Saccharose			
Sugar, Grape see Dextrose			
Sugar, Lead see Lead Acetate			
Sugar, Manna see Mannit			
Sugar, Milk see Lactose			
Sulfide Cubes (For H_2S)	.80		
Sulfite Cubes (For SO_2)	1.00	.20	
Sulfur Roll (Brimstone)	.25		
Sulfur Sublimed (Sulfur Flowers)	.25		
Sulfur washed U.S.P.	.30		
Sulfur Precipit pure—S_8	1.80		
Sulfur Chloride liquid—S_2Cl_2	.90		
Sulfur Dioxide, 6 lb. Cylinder—SO_2			7.00 incl.
Sulfur Iodide—S_2J_2	.80		
Sulphonethylmethane U.S.P.—$C_8H_{18}S_2O_4$			
Sulphonmethane U.S.P.—$(C_2H_5SO_2)_2:C:(CH_3)_2$			
Talcum Powd.	.30		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Talcum Powd. washed		.50		
Tannalbin (Tannin albuminate exsicc.)			1.40	
Tannin see Acid Tannic				
Tannoform (Tanninformaldehyde) —$C_2.H_{20}O_{18}$			.85	
Tartar Emetic see Antimon. Pot. Tartrate				
Tartar Soluble see Potass. Tartrate				
Terebene—$C_{10}H_{16}$		1.10	.25	
Terpin Hydrate— $C_6H_8(OH)_2CH_3)(C_3H_7)+H_2O$		1.10	.25	
Terpineol—$C_{10}H_{17}.OH$		2.25	.55	
Terpinol—$C_{10}H_{18}O$				
Test Lead see Lead Metal				
TEST PAPERS				
Litmus, red, blue, neutral	Sheet .05			Quire 1.50
Turmeric	Vial .12			
Congo Red, Lead Acetate, Methyl-Orange, Phenolphtalein, Potass. Iodide, Potass. Iodide Starch	Sheet .10			Quire 1.50
Tetrachlorethene see Carbon Dichloride				
Tetrachlorethylene see Carbon Dichloride				
Tetrachloromethane see Carbon Tetrachloride				
Tetraoxyphtalophenonanhydride see Fluoresceine				
Theine see Caffeine				
Theobromine (Dimethylxanthine from Cocao)—$C_7H_8N_4O_2$			2.50	
Theobromine Sodium Acetate (Agurin)—$C_7H_7N_4O_2Na+NaC_2H_3O_2$			1.75	
Theobromine Sodium Salicylate— $C_{14}H_{12}N_4O_5Na_2+H_2O$			1.80	
Thermit		1.30	.30	
Thigenol		5.40	.80	
Thiocarbanil see Oil Phenylmustard				
Thiocol (Potass. Guaiacolsulfonate) —$C_6H_3.(OCH_3)OH.SO_3K$			4.00	
Thionyl Chloride				
Thiophenol—C_6H_5SH				
Thiosinamine (Allyl Sulfocarbamide) —$C_4H_8N_2S$			4.90	
Thorium Chloride c.p.—$ThCl_4.8H_2O$				
Thorium Nitrate c.p.— $Th(NO_3)_4+4H_2O$				
Thymol cryst. c.p.—$C_{10}H_{14}O$				
Thymol Iodide U.S.P.—$C_{20}H_{24}O_2J_2$			2.00	
Thyroidin			2.00	
Tin Metal sticks—Sn		2.80	.55	
Tin Metal mossy		2.80	.55	
Tin Metal shot		2.80	.55	
Tin Metal powd. 20 mesh		2.90	.60	

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Tin Metal powd. 30 mesh—Sn		2.80	.55	
(Tin) Foil, Com'l composition		.65		
Tin Metal foil				
Tin (ic) **Ammonium Chloride** c.p.—$SnCl_4.(NH_4Cl)_2$		2.20	.45	
Tin Bichloride see Tin (ic) Chloride				
Tin (ic) **Chloride** cryst. c.p.—$SnCl_4$		1.80	.35	
Tin (ic) **Chloride** fuming c.p.		2.40	.50	
Tin (ous) **Chloride** pure		1.35	.30	
Tin (ous) **Chloride** c.p.—$SnCl_2+2H_2O$		1.80	.35	
Tin (ous) **Chloride** c.p. Solution—$SnCl_2$		2.05	.40	
Tin (ous) **Oxalate** c.p.—SnC_2O_4		2.75	.55	
Tin (ic) **Oxide** pure		1.50	.30	
Tin (ic) **Oxide** c.p.—SnO_2		2.40	.50	
Tin (ous) **Oxide** black c.p.—SnO		3.55	.55	
Tin (ous) **Phosphate** c.p.		3.55	.55	
Tin (ous) **Sulfate** c.p.—$SnSO_4$		2.40	.50	
Tin (ic) **Sulfide** (di) c.p.—SnS_2				
Tin (ous) **Sulfide** c.p.—SnS		2.75	.55	
Titanium Oxide anhydr. c.p.—TiO_2				
Titanium Oxide c.p.—H_2TiO_3				
Titanium Potass. Fluoride c.p.—TiK_2F_6+Aq				
Titanium Potass. Oxalate c.p.—$TiO:(COO.COOK)_2.2H_2O$				
Tolidin (Ortho)—$C_{14}H_{16}N_2$				
Toluene (Toluol or Methylbenzene)		2.00	.40	
Toluene c.p.—$C_6H_5.CH_3$		2.60	.55	
Toluidine (Ortho)—$C_6H_4.CH_3.NO_2[1:2]$				
Toluidine (Para)—$C_6H_4.CH_3.NH_2[1:4]$				
Traumaticin (Gutta Percha Chloroform sol. 5%)			.75	
Tribromomethane see Bromoform				
Tribromphenolbismuth see Xeroform				
Trichloromethane see Chloroform				
Triiodomethane see Iodoform				
Trimethylamine 10% aq. solut. (Propylamine)—$CH_3(CH_2)_2.NH_2+Aq$			1.20	
Trimethylbenzene see Cumene				
Trimethylene bromide—$CH_2Br.CH_2.CH_2Br$				
Trimethylenechlorohydrin				
Trimethylene glycol				
Trimethylethylene see Amylene				
Trimethylxanthine see Caffeine				
Trinitro benzene 1, 3, 5—$1:3:5C_6H_3(NO_2)_3$				
Trinitrophenol see Acid Picric				
Trioxybenzene see Phloroglucin				
Tungsten Metal—W				
Tungsten Oxide see Acid Tungstic				
Turmeric powd.		.80		

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.		Lb.	Oz.	
Turpentine Spirits see Oil Turpentine				
Turpentine Venice				
Uranium Acetate c.p.— $UO_2.(C_2H_3O_2)_2.NaC_2H_3O_2$			2.00	
Uranium Acetate Na free— $UO_2.(C_2H_3O_2)_2+2H_2O$			1.90	
Uranium Acetate Solution 10%— $UO_2(C_2H_3O_2)_2$		2.55	.50	
Uranium Chloride—$UO_2.Cl_2+H_2O$			1.25	
Uranium Nitrate cryst.— $UO_2(NO_3)_2+6H_2O$			.90	
Uranium Nitrate Na free			.90	
Uranium Nitrite c.p.— $UO_2(NO_3)_2+6H_2O$			1.80	
Uranium (ic) **Oxide** red—UO_3			2.00	
Uranium Oxide Yellow—Na_2UO_4			.50	
Uranium Sulfate— $UO_2SO_4.Na_2SO_4+2H_2O$			2.00	
Urea c.p.—CH_4N_2O		6.50	.95	
Urea Hydrochloride c.p.— $CO(NH_2)_2.HCl$			1.20	
Urea Nitrate c.p.—$CO(NH_2)_2.HNO_3$		8.60	1.25	
Urea Sulfate c.p.			1.75	
Urethane Phenyl see Euphorin				
Urotropin see Hexamethylenamine				
Valeryl Nitrile-N				
Vanadium Chloride— $2VO_2.4HCl+3H_2O$				
Vanillin—$C_8H_8O_3$			2.50	
Vaselin see Petrolatum				
Velatol			1.50	
Veratrine pure—$C_{32}H_{49}NO_9$				
Veratrine Sulfate— $(C_{32}H_{49}NO_9)_2.H_2SO_4$				
Verdigris see Copper Acetate				
Veronal (Diethylbarbituric Acid)— $(C_2H_5)_2:C:(CONH)_2:CO$			3.90	
Veronal Sodium				
Volumetric Solutions see Solutions				
Water Distilled see Distilled Water				
Water Ammonia see Ammon. Hydrate				
Water Bromine see Bromine				
Water Chlorine see Chlorine				
Water Lime				
Wax White		1.10		
Wax Yellow, Bee's		1.35		
Wax Carnauba		1.80	.35	
Wax Japan				
Wax Mineral see Ceresin				
Wax Paraffin see Paraffin				
Wax Sealing		.50		
Wax Sealing best sticks		1.25		
White Arsenic see Acid Arsenous				
White Lead see Lead carbonate				

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
White Precipitate (Mercury and Ammonium Chloride Mercury Ammoniated)—$HgNH_2Cl$	3.95	.60
White Vitriol see Zinc Sulfate		
Wolfram see Tungsten		
Wood Alcohol see Alcohol Methylic		
Wood Vinegar see Acid Pyroligneous		
Wool Fat see Lanum		
Xeroform (Tribromphenol Bismuth) —$Bi_2O_3(C_6H_2Br_3OH)$		1.60
Xylene pure Xylol	.90	
Xylene c.p.—$C_6H_4(CH_3)_2$	1.50	.30
Zinc Metal coml. mossy	1.65	.35
Zinc Metal coml. powd. (Dust)		
Zinc Metal c.p. dust	.95	
Zinc Metal coml. sheet	.80	
Zinc Metal pure turnings for H_2O anaylsis	1.90	.40
Zinc Metal c.p. sticks, shot, mossy—Zn	1.00	.20
Zinc Metal c.p. Special mossy, shot, sticks	1.40	.30
Zinc Metal c.p. powd. 30 mesh	1.00	.20
Zinc Metal c.p. powd. 20 mesh	1.10	.25
Zinc Metal c.p. powd. 40 mesh	1.15	.25
Zinc Metal c.p. powd. 80 mesh	1.15	.25
Zinc Metal c. p. Special powd. 20 mesh	1.50	.30
Zinc Metal c. p. Special powd. 30 mesh	1.40	.30
Zinc Metal c.p. Special powd. 40 mesh	1.60	.30
Zinc Metal c.p. Special powd. 80 mesh	1.60	.30
Zinc Metal platinized	1.90	.40
Zinc Metal amalgamated	1.90	.40
Zinc Acetate c.p.—$Zn(C_2H_3O_2)_2+3H_2O$	1.65	.35
Zinc Acetate pure—$Zn(C_2H_3O_2)_2$	1.00	.20
Zinc Arsenate—$Zn_3(AsO_4)_2.8H_2O$		.50
Zinc Arsenite c.p.—$Zn(AsO_2)_2$	4.35	.70
Zinc Benzoate—$Zn(C_7H_5O_2)_2$		1.60
Zinc Borate c.p.	3.90	.60
Zinc Bromate c.p.—$Zn(BrO_3)_2.6H_2O$		1.15
Zinc Bromide c.p.—$ZnBr_2$		1.00
Zinc Carbolate (Phenate)		.50
Zinc Carbonate ppt.	1.00	.20
Zinc Carbonate c.p.—$2ZnCO_3+3Zn(OH)_2$	2.00	.40
Zinc Chloride tech.		
Zinc Chloride gran. c.p.—$ZnCl_2$	1.00	.20
Zinc Chloride sticks c.p.	1.30	.30
Zinc Chloride pure	.90	
Zinc Chloride fused	1.10	.25
Zinc Chromate c.p.—$ZnCrO_4+7H_2O$	2.50	.50
Zinc Chromate pure	1.65	.35

Containers Extra—Prices Subject to Market Fluctuations.

CHEMICAL LIST

Name and Formula.	Lb.	Oz.
Zinc Cyanide pure—$Zn(CH)_2$		.65
Zinc Ferrocyanide— $Zn_2Fe(CN)_6+3H_2O$		
Zinc Hydroxide c.p.—$Zn(OH)_2$	1.35	.25
Zinc Hypophosphite— $Zn(H_2PO_2)_2+H_2O$		.75
Zinc Iodide c.p.—ZnJ_2		1.05
Zinc Lactate—$Zn(C_3H_5O_3)_2+3H_2O$		
Zinc Nitrate pure—$Zn(NO_3)_2$	1.10	.25
Zinc Nitrate c.p.	1.10	.20
Zinc Nitrate sticks c.p.	2.00	.40
Zinc Oleate—$Zn(C_{18}H_{32}O_2)_2$		
Zinc Oxalate c.p.—$ZnC_2O_4 2H_2O$	2.60	.50
Zinc Oxide tech.	.60	
Zinc Oxide dry process c.p. Mn. free —ZnO	1.10	.25
Zinc Oxide wet process c.p. Special	1.35	.30
Zinc Perborate c.p.—$Zn(BO_3).xH_2O$	6.50	1.00
Zinc Permanganate c.p.— $Zn(MnO_4)_2+2H_2O$		1.50
Zinc Peroxide c.p.—ZnO_2		1.20
Zinc Phosphate c.p.— $Zn_3(PO_4)_2+4H_2O$	2.20	.45
Zinc Phosphate c.p. secondary	2.80	.55
Zinc Phosphate pure	1.60	.30
Zinc Phosphide—Zn_3P_2		
Zinc Salicylate— $Zn(C_6H_4.OH.COO)_2+3H_2O$		.45
Zinc Stearate—$Zn(C_{18}H_{35}O_2)_2$	3.05	.45
Zinc Sulfate cryst. techn.	.30	
Zinc Sulfate pure	.95	
Zinc Sulfate c.p. anhyd.	1.50	.30
Zinc Sulfate cryst. c.p.— $ZnSO_4+7H_2O$	1.00	.20
Zinc Sulphate c.p. Special—$ZnSO_4$	1.35	.25
Zinc Sulfide techn.	1.50	.30
Zinc Sulfide c.p.—$ZnS+H_2O$	3.35	.50
Zinc Sulfide c.p. Special—ZnS	4.25	.65
Zinc Sulfite c.p.—$2ZnSO_3.5H_2O$	2.80	.55
Zinc Sulfite pure	2.15	.45
Zinc Sulfocarbolate pure— $Zn(C_6H_5SO_4)_2+8H_2O$	1.50	.30
Zinc Tannate pure—$Zn_3(C_{27}H_{19}O_{17})_2$		.45
Zinc Tartrate c.p.—$ZnC_4H_4O_6$		1.00
Zinc Valerate		

USEFUL INFORMATION

HELP IN CASE OF ACCIDENTS

DROWNING. 1. Loosen clothing, if any.

2. Empty lungs of water by laying body on its stomach, and lifting it by the middle so that the head hangs down. Jerk the body a few times.

3. Pull tongue forward, using handkerchief, or pin with string, if necessary.

4. Imitate motion of respiration by alternately compressing and expanding the lower ribs, about twenty times a minute. Alternately raising and lowering the arms from the sides up above the head will stimulate the action of the lungs. Let it be done gently but persistently.

5. Apply warmth and friction to extremities.

6. By holding tongue forward, closing the nostrils, and pressing the "Adam's apple" back (so as to close entrance to stomach), direct inflation may be tried. Take a deep breath and breathe it forcibly into the mouth of patient, compress the chest to expel the air, and repeat the operation.

7. **DON'T GIVE UP!** People have been saved after hours of patient, vigorous effort.

8. When breathing begins, get patient into a warm bed, give warm drinks, or spirits in teaspoonfuls, fresh air and quiet.

BURNS AND SCALDS. Cover with cooking soda and lay wet cloths over it. Whites of eggs and olive oil. Olive oil or linseed oil, plain, or mixed with chalk or whiting. Sweet or olive oil and lime water.

LIGHTNING. Dash cold water over a person struck.

SUNSTROKE. Loosen clothing. Get patient into shade and apply ice-cold water to head. Keep head in elevated position.

MAD DOG OR SNAKE BITE. Tie cord tight above wound. Suck the wound and cauterize with caustic or white-hot iron at once, or cut out adjoining parts with a sharp knife. Give stimulants, as whiskey, brandy, etc.

STINGS OF VENOMOUS INSECTS, ETC. Apply weak ammonia, oil, salt water, or iodine.

FAINTING. Place flat on back; allow fresh air and sprinkle with water. Place head lower than rest of body.

TESTS OF DEATH. Hold mirror to mouth. If living, moisture will gather. Push pin into flesh. If dead, the hole will remain; if alive, it will close up. Place fingers in front of a strong light, if alive, they will appear red; if dead, black or dark. If a person is dead, decomposition is almost sure to set in.

ANTIDOTES FOR POISONS

First.—Send for a physician.

Second.—Induce vomiting, by tickling throat with feather or finger; drinking hot water or strong mustard and water. Swallow sweet oil or whites of eggs.

Acids are antidotes for **Alkalies,** and vice versa.

ACIDS—Muriatic, Oxalic, Acetic, Sulphuric (Oil of Vitriol), Nitric (Aqua Fortis). Soap-suds, magnesia, lime-water.

PRUSSIC ACID. Ammonia in water; dash water in face; give solution cobalt nitrate.

CARBOLIC ACID. Flour and water, mucilaginous drinks.

ALKALIES—Potash, Lye, Hartshorn, Ammonia. Use vinegar or lemon juice in water.

ARSENIC—Rat Poison, Paris Green. Use milk, raw eggs, sweet oil, lime-water, flour and water.

BUG POISON—Lead, Saltpetre, Corrosive Sublimate, Sugar of Lead, Blue Vitriol. Use white of eggs or milk in large quantities.

CHLOROFORM—Chloral, Ether. Dash cold water on head and chest; artificial respiration.

CARBONATE OF SODA—Copperas, Cobalt. Use soap-suds and mucilaginous drinks.

IODINE—Antimony, Tartar Emetic. Use starch and water astringent infusions; strong tea.

MERCURY and its Salts. Use whites of eggs, milk mucilages.

OPIUM—Morphine, Laudanum, Paregoric, Soothing Powders or Syrups. Use strong coffee, hot bath; keep awake and moving at any cost.

ANTIDOTE FOR CYANIDE POISONING

All Cyanides are deadly poisons, but the aqueous solutions used in practice are so dilute that there is little or no danger from the prussic acid evolved from them if the buildings are properly ventilated.

Acids react on Cyandies, liberating Prussic Acid gas, which causes almost instant death when inhaled in a pure state. When diluted with air, it causes faintness, dizziness and a depressing frontal headache.

Even very dilute solutions of Cyanide are poisonous when taken internally, and, when they come in contact with the skin, produce in some persons an eruption of painful red boils. In cases where the hands and arms must be brought into contact with the solutions, rubber gloves, reaching over the elbows, should be provided for the workmen. Kaffir workmen are said to suffer no inconvenience whatsoever from the contact of their skin with Cyanide solutions.

If the poisoning is the result of inhaling Prussic Acid gas, it is advisable to make the patient inhale a small quantity of chlorine gas, ammonia or ether. The chlorine gas can be quickly made and applied by sprinkling a little bleaching powder on a piece of flannel moistened with Acetic Acid, and then holding the flannel to the nostrils of the patient.

EMERGENCY TREATMENT IN CYANIDE POISONING

This remedy consists, first of 7½ grms. of Ferrous Sulphate, dissolved in 30 cc. of water; second, 1½ grms. of Caustic Soda dissolved in 300 cc. of water; third, two grms. of magnesia. The first and second are to be kept in hermetically sealed bottles.

These three remedies, with a rubber stomach tube and a mouth gag, should be kept in a tin case 5 inches in diameter, and 7 inches high. There should also be a filtering shelf of finely perforated metal. The case serves as a vessel for the mixture for its ready use, and its cases should be in numerous handy places.

EVERYTHING DEPENDS UPON PROMPT ACTION

The bottles containing the antidotes can be broken over the filter shelf and emptied into the tin case, the shelf excluding any broken glass. The magnesia is added and the mixture given the patient as soon as possible. If already unconscious, the gag is put in the mouth, the stomach tube inserted and the mixture poured into the stomach.

Before or after the dose the stomach tube may be inserted and about half a pint of water poured down and then syphoned out by lowering the end of the tube. The stomach should be thoroughly washed out and vomiting induced either by mustard or by tickling the throat with a feather, should the tube not be at hand.

As soon as the antidote has been given and the tube withdrawn, artificial respiration should be resorted to as much as in the case of partial drowning or suffocation.

For skin trouble, cuts and bruises, bathe with hydrogen peroxide, and cover with vaseline.

WEIGHTS AND MEASURES.

SQUARE MEASURE, U. S. STANDARD

Inches.		Foot.		Yard.		Perch.		Rod.		Acre.
144	=	1.								
1296	=	9.	=	1.	=					
39204	=	272.25	=	30.25	=	1				
1568160	=	10890.	=	1210.	=	40	=	1		
6272640	=	43560.	=	4840.	=	160	=	4	=	1

An acre is 69.5701 yards square; or 208.710321 feet square.

SQUARE MEASURE, METRIC

		Sq. Metres.		U. S. Sq. In.		Sq. Feet.		Sq. Yards.		Acres.
1 Sq. Centimetre	=	.0001	=	.155						
1 Sq. Decimetre	=	.01	=	15.5	=	.10764	=	.01196		
1 Centiare	=	1.	=	1550.03	=	10.764	=	1.196	=	.00024
1 Are	=	100.	=	155003.	=	1076.4	=	119.6	=	.0247
1 Hectare	=	10000.	=		=	107641.	=	11960.	=	2.47

LIQUID OR WINE MEASURE, METRIC

In the Metric system the liquid and dry measures are the same.

		Litres.		U. S. Cu. Ins.		U. S.				
1 Millilitre	=	.001	=	.061	=	.00845	gill.			
1 Centilitre	=	.01	=	.61	=	.0845	gill.			
1 Decilitre	=	.1	=	6.1	=	.845	gill	=	.2113	pints.
1 Litre	=	1.	=	61.02	=	2.113	pints	=	1.056	quarts.
1 Decalitre	=	10.	=	610.16	=	2.641	gallons.			
		U. S. Cu. Ft.								
1 Hectolitre	=	100.	=	3.531	=	26.417	gallons.			
1 Kilolitre	=	1000.	=	35.31	=	264.17	gallons.			
1 Myrialitre	=	10000.	=	353.1	=	2641.7	gallons.			

LIQUID MEASURE, APOTHECARY

Gallon.		Pints.		Ounces.		Drams.		Mins.		Cu. Ins.		Grains of Water.		Cu. C. M.
	=	8	=	128	=	1024	=	61440	=	231.	=	58328.886	=	3785.00
		1	=	16	=	128	=	7680	=	28.875	=	7291.1107	=	473.11
				1	=	16	=	480	=	1.8047	=	455.6944	=	29.57
						1	=	60	=	0.2256	=	56.9618	=	3.70

LIQUID MEASURE

4 gills 1 pint
8 gills or 2 pints 1 quart
32 gills or 8 pints or 4 quarts ..... 1 gallon
31½ gallons ..... 1 barrel
2 barrels or 63 gallons ..... 1 hogshead

TABLE TO CONVERT U. S. LIQUID MEASURE INTO METRIC LIQUID MEASURE

As one U. S. liquid ounce is equal to 29.572 cubic centimeters and one pint is equal to 0.4731 litres, to convert:

Pints into litres ..... multiply by 0.4731
Fluid ounces into cubic centimeters ..... multiply by 29.572

TABLE TO CONVERT METRIC LIQUID MEASURE INTO U. S. LIQUID MEASURE

As one Litre, or 1000 cc., is equal to 33.8149 ounces, to convert:

Litres into fluid ounces ..... multiply by 33.815
Cubic centimeters into fluid ounces ..... multiply by 0.0338
Litres into pints ..... multiply by 2.113

WEIGHTS AND MEASURES

COMPARISONS AND EQUIVALENTS

TROY WEIGHT

For weighing precious metals, such as Gold, Platinum, Silver, etc., Troy weights are used exclusively.

The U. S. Standard Troy pound was copied in 1827 from the imperial Troy pound of England for the use of the United States Mint, and there deposited. It is standard in air at 62° Fahr., the barometer at 30 inches.

24 grains = 1 pwt.
480 grains = 20 pwt. = 1 oz.
5760 grains = 240 pwt. = 12 oz. = 1 lb. = 22.816 cub. in. of distilled water at 62° Fahr.

Avoirdupois Weight

For weighing base metals such as Lead, Antimony, Tin, etc., and the weight in general use in trade and commerce in the U. S.

1 drachm =			27.34375	grains Troy.			
16 drachm =	1 oz =		437.5	grains Troy.			
256 drachm =	16 oz =		1 lb =	1.2153	lb.	Troy.	
6400 drachm =	400 oz =		25 lb =	1 quarter.			
25600 drachm =	1600 oz =		100 lb =	4 quarter =	1	cwt.	
512000 drachm =	32000 oz =		20000 lb =	80 quarter =	20	cwt. =	1 ton.

APOTHECARIES' WEIGHT

20 grains =	1 scruple.					
60 grains =	3 scruple =	1	drachm.			
480 grains =	24 scruple =	8	drachm =	1	oz.	
5760 grains =	288 scruple =	96	drachm =	12	oz. =	1 lb.

TABLE TO CONVERT AVOIRDUPOIS AND TROY WEIGHTS INTO METRIC WEIGHTS

As one grain is equal to 0.0648 and one avoirdupois ounce is equal to 28.3495 grammes, and one Troy ounce is equal to 31.1035 grammes, to convert:

Grains into grammes	multiply by 0.0648
Grains into centigrammes	multiply by 6.4799
Grains into milligrammes	multiply by 64.799
Avoirdupois ounces into kilogrammes	multiply by 0.02835
Avoirdupois ounces into grammes	multiply by 28.3495
Avoirdupois ounces into kilogrammes	multiply by 0.4536
Troy ounces into kilogrammes	multiply by 0.0311
Troy ounces into grammes	multiply by 31.1035

METRIC OR FRENCH WEIGHTS

	Grammes.	Troy grs.	Troy ozs.	Troy lbs.	Avoir. ozs.	Avoir. lbs.
1 Milligrm =	.001 =	.01543				
1 Centigrm =	.01 =	.15432				
1 Decigrm =	.1 =	1.5432				
1 Gramme =	1. =	15.432	.032 =	.00267 =	.03528 =	.0022047
1 Decagrm =	10. =	.....	.321 =	.02679 =	.3528 =	.022046
1 Hectogrm =	100. =	.....	3.215 =	.26792 =	3.52758 =	.22046
1 Kilogrm =	1000. =	.....	32.150 =	2.6792 =	35.2758 =	2.2046
1 Myriagrm =	10000. =	.....	.....	26.792 =	..... =	22.046
1 Quintal =	100000. =	.....	.....	267.92 =	..... =	220.46
1 Tonneau =	1000000. =	.....	.....	2679.2 =	..... =	2204.6

The unit of the metric system is the gramme = 15.438395 Troy grains, or the weight of 1 cc. of distilled water at 4° C.

WEIGHTS AND MEASURES

TABLE TO CONVERT METRIC WEIGHTS INTO AVOIRDUPOIS AND TROY WEIGHTS

As one gramme is equal to 15.432×grains, or .03527 Avoirdupois ounce, or .03215 Troy ounce, to convert:

Grammes into grains	multiply by 15.432
Centigrammes into grains	multiply by 0.15432
Milligrammes into grains	multiply by 0.01543
Kilogrammes into Avoirdupois ounces	multiply by 35.2739
Grammes into Avoirdupois ounces	multiply by .03527
Kilogrammes into Avoirdupois pounds	multiply by 2.2046
Kilogrammes into Troy ounces	multiply by 32.1507
Grammes into Troy ounces	multiply by .03215

LINEAR MEASURE, U. S. STANDARD

The standard unit of the United States and British linear measure is the yard. It was intended to be exactly the same for both countries, but in reality the United States yard exceeds the British standard by .00087 inch. The actual standard of length for the United States is a brass scale 82 inches long prepared for the Coast Survey and deposited in the office of weights and measures at the U. S. Treasury Department, Washington. The yard is between the 27th and 63d inches of this scale. The temperature at which this scale is designed to be standard, and at which it is used in the U. S. Coast Survey, is 62° Fahrenheit.

Inches	Foot	Yard	Fathom	Perch	Furlong	Mile	League
12 =	1.						
36 =	3. =	1.					
72 =	6. =	2. =	1.				
198 =	16.5 =	5.5 =	2.75 =	1			
7920 =	660. =	220. =	110. =	40 =	1		
63360 =	5280. =	1760. =	880. =	320 =	8 =	1	
190080 =	15840. =	5280. =	2640. =	960 =	24 =	3 =	1

LINEAR MEASURE, METRIC

	Metre	U. S. Ins.	Feet	Yards	Miles
1 Millimetre =	.001 =	.03937 =	.00328		
1 Centimetre =	.01 =	.3937 =	.0328		
1 Decimetre =	.1 =	3.937 =	.32808 =	.10936	
1 Metre =	1. =	39.3704 =	3.2808 =	1.0936	
1 Decametre =	10. =	393.704 =	32.808 =	10.936	
1 Hectometre =	100. =		328.08 =	109.36 =	.0621375
1 Kilometre =	1000. =		3280.8 =	1093.6 =	.621375
1 Myriametre =	10000. =		32808. =	10936. =	6.21375

TABLE TO CONVERT U. S. LINEAR MEASURE INTO METRIC LINEAR MEASURE

As one inch is equal to 0.0254 meters, to convert:

Inches into meters	multiply by 0.0254
Inches into centimeters	multiply by 2.5399
Inches into millimeters	multiply by 25.3997

CUBIC MEASURE, METRIC

	Cu. Metres.	U. S. Cu. Ins.	U. S. Cu. Ft.	U. S. Cu. Yds.
1 Cubic Centimetre =	.000001 =	.061025		
1 Cubic Decimetre =	.001 =	61.025 =	.353156	
1 Centistere =	.01 =	610.25 =	3.53156 =	.13080
1 Decistere =	.1 =	6102.5 =	35.3156 =	1.3080
1 Stere =	1. =	=	353.156 =	13.080
1 Decastere =	10 =	=	3531.56 =	130.80
1 Hectostere =	100. =	=		

REFERENCE TABLES

METRIC CONVERSION TABLE

Millimeters	×	.03937	=	Inches
Millimeters	=	25.400	×	Inches
Meters	×	3.2809	=	Feet
Meters	=	.3048	×	Feet
Kilometers	×	.621377	=	Miles
Kilometers	=	1.6093	×	Miles
Square centimeters	×	.15500	=	Square inches
Square centimeters	=	6.4515	×	Square inches
Square meters	×	10.76410	=	Square feet
Square meters	=	.09290	×	Square feet
Square kilometers	×	247.1098	=	Acres
Square kilometers	=	.00405	×	Acres
Hectares	×	2.471	=	Acres
Hectares	=	.4047	×	Acres
Cubic centimeters	×	.061025	=	Cubic inches
Cubic centimeters	=	16.3866	×	Cubic inches
Cubic meters	×	35.3156	=	Cubic feet
Cubic meters	=	.02832	×	Cubic feet
Cubic meters	×	1.308	=	Cubic yards
Cubic meters	=	.765	×	Cubic yards
Litres	×	61.023	=	Cubic inches
Litres	=	.01639	×	Cubic inches
Litres	×	.26418	=	U. S. gallons
Litres	=	3.7854	×	U. S. gallons
Grams	×	15.4324	=	Grains
Grams	=	.0648	×	Grains
Grams	×	.03527	=	Ounces, av'dupois
Grams	=	28.3495	×	Ounces, av'dupois
Kilograms	×	2.2046	=	Pounds
Kilograms	=	.4536	×	Pounds
Kilog's per sq. centimeter	×	14.2231	=	Lbs. per sq. inch
Kilog's per sq. centimeter	=	.0703	×	Lbs. per sq. inch
Kilogram per cubic meter	×	.06243	=	Lbs. per cubic foot
Kilogram per cubic meter	=	16.01890	×	Lbs. per cubic foot
Metric tons (1,000 kilog's)	×	1.1023	=	Tons (2,000 lbs.)
Metric tons (1,000 kilog's)	=	.9072	×	Tons (2,000 lbs.)
Kilowatts	×	1.3405	=	Horse-powers
Kilowatts	=	.746	×	Horse-powers
Calories	×	3.9683	=	B. T. units
Calories	=	.2520	×	B. T. units
Francs	×	.193	=	Dollars
Francs	=	5.18	×	Dollars

REFERENCE TABLES

FRACTIONAL PARTS OF AN INCH EXPRESSED IN THOUSANDTHS

The following tables will be found very convenient for the transportation of fractional parts of an inch, or decimal parts of a millimeter to decimals of an inch:

Eighths	Thirty-seconds	Sixty-fourths	Sixty-fourths
$\frac{1}{8}$ =.125	$\frac{1}{32}$ =.03125	$\frac{1}{64}$ =.015625	$\frac{33}{64}$ =.515625
$\frac{1}{4}$ =.250	$\frac{3}{32}$ =.09375	$\frac{3}{64}$ =.046875	$\frac{35}{64}$ =.546875
$\frac{3}{8}$ =.375	$\frac{5}{32}$ =.15625	$\frac{5}{64}$ =.078125	$\frac{37}{64}$ =.578125
$\frac{1}{2}$ =.500	$\frac{7}{32}$ =.21875	$\frac{7}{64}$ =.109375	$\frac{39}{64}$ =.609375
$\frac{5}{8}$ =.625	$\frac{9}{32}$ =.28125	$\frac{9}{64}$ =.140625	$\frac{41}{64}$ =.640625
$\frac{3}{4}$ =.750	$\frac{11}{32}$ =.34375	$\frac{11}{64}$ =.171875	$\frac{43}{64}$ =.671875
$\frac{7}{8}$ =.875	$\frac{13}{32}$ =.40625	$\frac{13}{64}$ =.203125	$\frac{45}{64}$ =.703125
	$\frac{15}{32}$ =.46875	$\frac{15}{64}$ =.234375	$\frac{47}{64}$ =.734375
Sixteenths	$\frac{17}{32}$ =.53125	$\frac{17}{64}$ =.265625	$\frac{49}{64}$ =.765625
	$\frac{19}{32}$ =.59375	$\frac{19}{64}$ =.296875	$\frac{51}{64}$ =.796875
$\frac{1}{16}$ =.0625	$\frac{21}{32}$ =.65625	$\frac{21}{64}$ =.328125	$\frac{53}{64}$ =.828125
$\frac{3}{16}$ =.1875	$\frac{23}{32}$ =.71875	$\frac{23}{64}$ =.359375	$\frac{55}{64}$ =.859375
$\frac{5}{16}$ =.3125	$\frac{25}{32}$ =.78125	$\frac{25}{64}$ =.390625	$\frac{57}{64}$ =.890625
$\frac{7}{16}$ =.4375	$\frac{27}{32}$ =.84375	$\frac{27}{64}$ =.421875	$\frac{59}{64}$ =.921875
$\frac{9}{16}$ =.5625	$\frac{29}{32}$ =.90625	$\frac{29}{64}$ =.453125	$\frac{61}{64}$ =.953125
$\frac{11}{16}$ =.6875	$\frac{31}{32}$ =.96875	$\frac{31}{64}$ =.484375	$\frac{63}{64}$ =.984375
$\frac{13}{16}$ =.8125			
$\frac{15}{16}$ =.9375			

DECIMAL PARTS OF A MILLIMETER EXPRESSED IN DECIMAL PARTS OF AN INCH

MM	Inches	MM	Inches	MM	Inches	MM	Inches	MM	Inches
1	.03937	.80	.0314960	.60	.0236220	.40	.0157480	.20	.0078740
.99	.0389765	.79	.0311023	.59	.0232283	.39	.0153543	.19	.0074803
.98	.0385826	.78	.0307086	.58	.0228346	.38	.0149606	.18	.0070866
.97	.0381889	.77	.0303149	.57	.0224409	.37	.0145669	.17	.0066929
.96	.0377952	.76	.0299212	.56	.0220472	.36	.0141732	.16	.0062992
.95	.0374015	.75	.0295275	.55	.0216535	.35	.0137795	.15	.0059055
.94	.0370078	.74	.0291338	.54	.0212598	.34	.0133858	.14	.0055118
.93	.0366141	.73	.0287401	.53	.0208661	.33	.0129921	.13	.0051181
.92	.0362204	.72	.0283464	.52	.0204724	.32	.0125984	.12	.0047244
.91	.0358267	.71	.0279527	.51	.0200787	.31	.0122047	.11	.0043307
.90	.0354330	.70	.0275590	.50	.019685	.30	.0118110	.10	.0039370
.89	.0350393	.69	.0271653	.49	.0192913	.29	.0114173	.09	.0035433
.88	.0346456	.68	.0267716	.48	.0188976	.28	.0110236	.08	.0031496
.87	.0342519	.67	.0263779	.47	.0185039	.27	.0106299	.07	.0027559
.86	.0338582	.66	.0259842	.46	.0181102	.26	.0102362	.06	.0023622
.85	.0334645	.65	.0255905	.45	.0177165	.25	.0098425	.05	.0019685
.84	.0330708	.64	.0251968	.44	.0173228	.24	.0094488	.04	.0015748
.83	.0326771	.63	.0248031	.43	.0169291	.23	.0090551	.03	.0011811
.82	.0322834	.62	.0244094	.42	.0165354	.22	.0086614	.02	.0007874
.81	.0318897	.61	.0240157	.41	.0161417	.21	.0082677	.01	.0003037

FOREIGN MONEYS AND U. S. EQUIVALENTS

GREAT BRITAIN AND BRITISH COLONIES

1 Penny = 2 cents. 1 Shilling = 24 cents. 1 Pound = $4.80.

$ c	£ s d	$ c	£ s d	$ c	£ s d
.05	2½	1.25	5.2½	5.00	1.0.10
.10	5	1.50	6.3	10.00	2.1.8
.25	1.½	1.75	7.3½	15.00	3.2.6
.50	2.1	2.00	8.4	20.00	4.3.4
.75	3.1½	3.00	12.6	25.00	5.4.2
1.00	4.2	4.00	16.8	50.00	10.8.4

GERMANY

1 Pfennig = .238 cent. 10 Pfennigs = 2.38 cents. 1 Mark = 23.8 cents.
$1.00 = 4.20 Marks.

FRANCE, BELGIUM AND SWITZERLAND

1 Centime = .193 cent. 10 Centimes = 1.93 cents. 1 Franc = 19.3 cents.
$1.00 = 5.18 Francs.

RUSSIA

1 Ruble = 51.5 cents.
$1.00 = 1.94 Rubles.

SWEDEN, NORWAY AND DENMARK

1 Krona = 26.8 cents.
$1.00 = 3.73 Kronor.

SPAIN (GOLD)

1 Peseta = 19.3 cents.
$1.00 = 5.18 Pesetas (gold).

ITALY

1 Lira = 19.3 cents.
$1.00 = 5.18 Lire.

GREECE

1 Drachma = 19.3 cents.
$1.00 = 5.18 Drachmas.

AUSTRIA-HUNGARY

1 Heller = .203 cent. 10 Heller = 2.03 cents. 1 Krone = 20.3 cents.
$1.00 = 4.925 Kronen.

NETHERLANDS

1 Florin = 40.2 cents.
$1.00 = 2.48 Florins.

JAPAN

1 Yen = 49.8 cents.
$1.00 = 2 Yen.

COMMON CHEMICALS

CORRECT NAMES FOR SOME OF THE MORE COMMON CHEMICALS

Aqua Fortis	Nitric Acid
Aqua Regia	Nitric and Muriatic Acids
Barytes	Barium Oxide
Barytes	Barium Sulphate
Blue Stone, Blue Vitriol	Copper Sulphate
Borax	Sodium Borate
Brimstone	Sulphur
Butter of Antimony	Antimonious Chloride
Calomel	Mercurous Chloride
Chalk	Calcium Carbonate
Copperas, Green Vitriol	Iron Sulphate
Corrosive Sublimate	Mercuric Chloride
Cream of Tartar	Potassium Bitartrate
Epsom Salts	Magnesium Sulphate
Fowler's Solution	Potassium Arsenite
Glauber's Salts	Sodium Sulphate
Gypsum	Calcium Sulphate
Horn Silver	Silver Chloride
Hartshorn	Ammonia Water
Hypo	Sodium Hyposulphite
Laughing Gas	Nitrous Oxide
Lime	Calcium Oxide
Lime Water	Calcium Hydrate
Litharge	Lead Oxide
Lunar Caustic	Silver Nitrate
Liver of Sulphur	Potassium Sulphide
Magnesia	Magnesium Oxide
Meerschaum	Magnesium Silicate
Mosaic Gold	Tin Bisulphide
Nitre	Sodium Nitrate
Nitre-Cake	Sodium Bisulphate
Oil of Vitriol	Sulphuric Acid
Prussian Blue	Ferric Ferro-Cyanide
Prussic Acid	Hydrocyanic Acid
Pyro	Pyrogallic Acid
Quicksilver	Mercury
Red Lead	Lead Oxide
Red Precipitate	Red Murcuric Oxide
Rochelle Salts	Potassium and Sodium Tartrate
Salt (common)	Sodium Chloride
Saltpetre	Potassium Nitrate
Salt Cake	Sodium Sulphate
Sal-Ammoniac	Ammonium Chloride
Sal-Soda	Sodium Carbonate, Cryst.
Sal-Volatile	Ammonium Bicarbonate
Soda Ash	Sodium Carbonate
Spirits of Salt	Muriatic Acid
Sugar of Lead	Lead Acetate
Tartar-Emetic	Antimony and Potassium Tartrate
Verdigris	Copper Sub-Acetate
Vinegar	Acetic Acid
Water Glass	Sodium Silicate
White Lead	Lead Carbonate
White Precipitate	Mercuric-Ammonium Chloride
White Vitriol	Zinc Sulphate
White Zinc	Zinc Oxide

A LIST OF THE COMMONER MINERALS, THEIR DESCRIPTION AND SPECIFIC GRAVITIES

Aluminum	Al		2.60
Andalusite	Al_2SiO_5	Silicate of aluminum	3.16–3.20
Anglesite	$PbSO_4$	Lead Sulphate	6.12–6.39
Anthracite		Hard Coal	1.32–1.70
Antimony	Sb		6.71
Apatite	$3Ca_3P_2O_8$, CaF_2	Phosphate of lime	3.17–3.23
Aragonite	$CaCo_3$	Carbonate of lime	2.94
Argentite	Ag_2S	Silver Sulphide	7.20–7.36
Arsenic	As		5.73
Arsenolite	As_2O_3	White arsenic	3.70–3.72
Asphaltum			1.0 –1.80
Atacamite	$CuCl_{23}CCu(OH)_2$	Chloride of copper	3.75
Azurite	$Cu_3(OH)_2(CO_3)_2$	Blue carbonate of copper	3.77–3.83
Barite	$BaSO_4$	Barium sulphate	4.3 –4.6
Bauxite	$Al_2O_32H_2O$	Hydrate oxide of aluminum	2.55
Beryl	$Be_3Al_2Si_6O_{18}$	Silicate of beryllium	2.63–2.80
Biotite		Magnesia-iron mica	2.70–3.10
Bismuth	Bi		9.80
Bismuthinite	Bi_2S_3	Sulphide of bismuth	6.4 –6.50
Bituminous Coal		Soft Coal	1.14–1.40
Bornite	Cu_2FeS_3	Sulphide of copper and iron	4.90–5.40
Cadmium	Cd		8.60
Calamine	$H_2Zn_2SiO_5$	Silicate of zinc	3.40–3.50
Calcite	$CaCo_3$	Carbonate of lime	2.7
Cassiterite	SnO_2	Dioxide of tin	6.8 –7.10
Cerargyrite	$AgCl$	Horn silver	5.55
Cerussite	$PbCo_3$	Carbonate of lead	6.46–6.57
Chalcocite	Cu_2S	Copper glance	5.5 –5.8
Chalcopyrite	$CuFeS_2$	Copper pyrite	4.1 –4.3
Chromite	$FeCr_2O_4$	Chromic iron	4.32–4.57
Chromium	Cr		6.50
Chrysolite	$(MgFe)_2SiO_4$	Silicate of magnesia and iron	3.27–3.37
Cinnabar	HgS	Sulphide of mercury	8.0 –8.2
Cobalt			8.6
Cobaltite	$CoAsS$	Sulph-arsenic of cobalt	6.0 –6.30
Copper	Cu		8.8 –8.90
Corundum	Al_2O_3	Oxide of aluminum	3.95–4.10
Cryolite	Na_3AlF_6	Fluoride of aluminum and sodium	3.00
Cuprite	Cu_2O	Red copper ore	5.85–6.15
Cyanite	Al_2SiO_5	Aluminum silicate	3.56–3.67
Diamond	C		3.50
Dolomite	$(CaMg)CO_3$	Carbonate of lime and magnesia	2.80–2.90
Enargite	$CuAsS_4$		4.45
Epidote	$HCa_2(AlFe)_3Si_3O_{13}$	Silicate of iron alumina and lime	3.25–3.5
Fluorite	CaF_2	Fluor spar	3.2

			Spec. Grav.
Franklinite		Oxide of zinc, manganese and iron	5.07–5.22
Galena	PbS	Sulphide of lead	7.43
Garnet			3.15–4.3
Gold	Au		15.6–19.3
Graphite	C		2.09–2.23
Gypsum	$CaSo_4+2H_2O$	Sulphate of lime	2.3
Hematite	Fe_2O_3	Red oxide of iron	4.9 –5.3
Ice	H_2O		0.916
Iodyrite	AgI	Iodide of silver	5.6–5.7
Iridium	Ir		22.42
Iron	Fe		7.86
Kaolinite	$2H_2OAl_2O_32SiO_2$	Silicate of alumina	2.6
Lead	Pb		11.37
Limonite	$2Fe_2O_33H_2O$	Brown oxide of iron	3.6 –4.0
Magnesite	$MgCo_3$	Carbonate of magnesia	3.0 –3.12
Magnetite	FeO, Fe_2O_3	Magnetic oxide of iron	5.16–5.18
Malachite	$Cu_2(OH)_2CO_3$	Green carbonate of copper	3.9 –4.0
Manganese	Mn		7.39
Manganite	$Mn_2O_3H_2O$	Hydrate manganese oxide	4.2 –4.4
Monazite			4.8 –5.1
Marcasite	FeS_2	White iron pyrite	4.85–4.90
Mercury	Hg		13.6
Millerite	NiS	Nickel sulphide	5.3 –5.6
Mimetite	$3PB_3As_2O_8PbCl_2$	Lead arsenate	7.0 –7.25
Muscovite	$H_2KAl_3(SiO_4)_3$	Potash mica	2.76–3.0
Naphtha			0.60–0.756
Niccolite	$NiAs$	Nickel arsenide	7.33–7.67
Nickel	Ni		8.9
Opal	SiO_2nH_2O		1.9 –2.3
Orpiment	As_2S_3	Yellow sulphide of arsenic	3.4 –3.5
Orthoclase	$KAlSi_3O_8$	Potash feldspar	2.46–2.6
Ozocerite		Mineral wax	0.85–0.90
Palladium	Pd		11.3–11.8
Platinum	Pt		14.0–19.0
Proustite	Ag_3AsS_3	Light red silver ore	5.57–5.64
Pyrargyrite	Ag_3SbS_3	Dark red silver ore	5.77–5.86
Pyrite	FeS_2	Iron sulphide	4.95–5.10
Pyrolusite	MnO_2	Dioxide of manganese	4.82
Pyromorphite	$3Pb_3P_2O_8PbCl_2$	Lead phosphate	6.5 –7.1
Pyrrhotite	$Fe_{11}S_{12}$	Magnetic pyrite	4.58–4.64
Quartz	SiO_2		2.65–2.66
Realgar	AsS	Red sulphide of arsenic	3.55
Rhodochrosite	$MnCo_3$	Carbonate of manganese	3.45–3.6
Rhodonite	$MnSiO_3$	Silicate of manganese	3.40–3.68
Rutile	TiO_3	Dioxide of titanium	4.2
Serpentine	$H_4Mg_3Si_2O_9$	Silicate of magnesia	2.50–2.65
Siderite	$FeCO_3$	Carbonate of iron	3.8 –3.9
Silver	Ag		10.1–11.1

			Spec. Grav.
Smaltite	$CoAs_2$	Arsenide of cobalt	6.4 –6.6
Smithsonite	$ZnCo_3$	Carbonate of zinc	4.30–4.45
Sphalerite	ZnS	Sulphide of zinc	3.9 –4.
Spinel	$MgAl_2O_4$	Aluminate of magnesia	3.5 –4.1
Stephanite	$AgsSbS_4$	Brittle silver	6.2 –6.3
Stibnite	Sb_2S_3	Sulphide of antimony	4.5 –4.6
Sulphur	S		2.08
Sylvanite	$(Au, Ag)Te$	Telluride of gold and silver	7.9 –8.3
Talc	$H_2Mg_3Si_4O_{12}$	Silicate of magnesia	2.7 –2.8
Tephroite	Mn_2SiO_4	Silicate of manganese	4.0 –4.1
Tetrahedrite	$4Cu_2S, Sb_2S_3$	Gray copper	4.4 –5.1
Tin	Sn		7.29
Topaz		Fluo-silicate of alumina	3.4 –3.6
Tourmaline		Silicate of alumina, iron and magnesia	2.98–3.20
Willemite	Zn_2SiO_4	Silicate of zinc	3.9 –4.18
Wolframite	$(Fe, Mn)WO_4$	Tungstate of iron and manganese	7.2 –7.5
Wulfenite	$PbMoO_4$	Molybdate of lead	6.7 –7.0
Zinc	Zn		7.15
Zincite	ZnO	Zinc oxide	5.43–5.7
Zircon	$ZrSiO_4$	Silicate of zerconium	4.70

USEFUL INFORMATION

RULES FOR CALCULATING THE SPEED OF PULLEYS

The diameter of the driven being given, to find its number of revolutions: **RULE**—Multiply the diameter of the driver by the number of revolutions and divide by the diameter of the driven; the quotient will be the number of revolutions to the driven.

The diameter and revolutions of the driver being given, to find the diameter of the driven that shall make any given number of revolutions in the same time: **RULE**—Multiply the diameter of the driver by its number of revolutions and divide the product by the number of revolutions at which the driver is to run; the quotient will be the diameter.

To ascertain the size of the driver: **RULE**—Multiply the diameter of the driven by the number of revolutions you wish to make and divide the product by the revolutions of the driver; the quotient will be the diameter of the driver.

In ordering pulleys, give first the diameter, then the face, exact bore, whether key seated or set screwed, and whether flat face for shifting belt or crowning for non-shifting belt.

HOW TO ASCERTAIN HORSE POWER OF BOILERS

Standard adopted by American Society of Mechanical Engineers is 30 pounds of water evaporated into dry steam per hour from temperature of feed water 100° Fahrenheit, into steam 70 pounds pressure.

Compound engines will develop a horsepower on 15 pounds of water.

Single condensing engine will develop a horsepower on 18 to 22 pounds of water.

Automatic non-condencing engines will develop a horsepower on 28 to 32 pounds of water.

Slide-valve throttle-governing engines will develop a horsepower on 40 to 60 pounds of water.

STEAM MEMORANDA

A cubic inch of water evaporated under ordinary atmospheric pressure is converted into one cubic foot of steam (approximately).

The specific gravity of steam (at atmospheric pressure) is .411 that of air at 34° Fahrenheit, and .0006 that of water at same temperature.

27.222 cubic feet of steam weigh one pound; 13.817 cubic feet of air weigh one pound.

Locomotives average a consumption of 3,000 gallons of water per 100 miles run.

The best designed boilers, well set, with good draft, and skillful firing, will evaporate from 7 to 10 pounds of water per pound of first-class coal.

On one square foot of grate can be burned on an average from 10 to 12 pounds of hard coal, or 18 to 20 pounds of soft coal, per hour, with natural draft. With forced draft nearly double these amounts can be burned.

Steam engines, in economy, vary from 14 to 60 pounds of feed water, and from 1½ to 7 pounds of coal per hour per indicated horsepower.

Condensing engines require from 20 to 30 gallons of water, at an average low temperature, to condense the steam represented by every gallon of water evaporated in the boilers supplying the engines—approximately for most engines, we say, from 1 to 1½ gallons condensing water per minute, per indicated horsepower.

WATER

Note.—These figures are all for water at its maximum density, that is, at a temperature of 39.2° Fahrenheit.

1 cubic foot of water = 62.425 pounds, = 28.3153 kilos, = 7.48 gallons.
1 cubic inch of water = 0.036125 pounds, = 252.88 grains, = 16.386 grams.
1 ton of water = 32.038 cubic feet, = 239.665 gallons.

USEFUL INFORMATION

1 pound of water = 0.016019 cubic foot, = 0.47933 quart, = 27.681 cubic inches, = 0.45359 liter.
1 gallon of water = 8.3448 pounds.
1 cubic meter of water = 2204.6 pounds.
1 kilo of water, or 1 liter = 2.2046 pounds, = 0.035317 cubic foot, = 61.027 cubic inches, = 1.0567 quarts.
1 cubic centimeter of water = 1 gram, = 15.432 grains.

RUST-JOINT CEMENT.—(Quickly setting.)—1 sal-ammoniac in powder (by weight), 2 flour of sulphur, 80 iron borings made to a paste with water.

RUST-JOINT.—(Slowly setting.)—2 sal-ammoniac, 1 flour of sulphur, 200 iron borings. The latter cement is the best if the joint is not required for immediate use.

CASE-HARDENING.—Place horn, hoof, bone-dust, or shreds of leather, together with the article to be case-hardened, in an iron box subject to a blood-red heat, then immerse the article in cold water.

CASE-HARDENING WITH PRUSSIATE OF POTASH.—Heat the article after polishing, to a bright red, rub the surface over with prussiate of potash; allow it to cool to dull red and immerse it in water.

CASE-HARDENING MIXTURES.—3 prussiate of potash, 1 sal-ammoniac. Or, 1 prussiate of potash, 2 sal-ammoniac, 2 bone-dust.

GLUE TO RESIST MOISTURE.—1 pound of glue melted in 2 quarts of skim milk.

MARINE GLUE.—1 of India rubber, 12 of mineral naphtha or coal tar. Heat gently, mix, and add 20 of powdered shellac. Pour out on a slab to cool. When used, to be heated to about 250 degrees.

GLUE CEMENT TO RESIST MOISTURE.—1 glue, 1 black rosin, ¼ red ochre. Mix with least possible quantity of water. Or, 4 of glue, or 1 oxide of iron, 1 of boiled oil (by weight).

TO REMOVE RUST FROM STEEL.—Steel which has been rusted can be cleaned by brushing with a paste compound of ½ ounce cyanide potassium, ½ ounce castile soap, 1 ounce whiting, and water sufficient to form a paste. The steel should be washed with a solution of ½ ounce cyanide potassium in 2 ounces water.

TO PRESERVE STEEL FROM RUST.—1 caoutchouc, 16 turpentine. Dissolve with a gentle heat, then add 8 parts boiled oil. Mix by bringing them to the heat of boiled water; apply to the steel with a brush, in the way of varnish. It may be removed with turpentine.

TO CLEAN BRASS.—1 roche alum and 16 water. The articles to be cleaned must be made warm, then rubbed with the above mixture, and finished with fine tripoli.

CEMENT TO RESIST FIRE AND WATER AND HARDEN QUICKLY.—Two parts finely sifted unoxidized iron filings; one part perfectly dry, finely powdered loam. Knead the mixture with strong vinegar, into a homogeneous plastic mass, to be used as soon as made.

FOR TURNED AND BORED JOINTS.—One part white lead, one part red lead. Mix with boiled linseed oil to the proper consistency.

FOR STOPPING JOINTS, ETC.—White lead in oil, mixed with enough white sand to make a stiff paste. This grows hard by exposure, and resists heat, cold and water.

GLYCERINE CEMENT.—A valuable cement for general use, stopping leaks in tanks, joining chemical apparatus, such as glass and brass; in fact, closing cracks and stopping leaks in almost everything, may be made by mixing commercial glycerine and litharge to the consistency of dough. It may be somewhat improved by using Portland cement and litharge, equal parts, when the joints or cracks are large.

USEFUL INFORMATION

Eighty parts of sifted cast iron turning, two parts of powdered sal-ammoniac, and one part sulphur, made into a thick paste with water and mixed fresh for use, makes a good cement for stopping holes in castings.

Asbestos is one flexible substance that electricity will not burn.

Wood ashes can be used to assist in keeping amalgamated table plates in good working condition where the mill is not run nights. After shutting off the power at night and brushing up the plates, wood ashes freely sprinkled over them, and wet to form a paste, can be left on them till morning. The potash of the wood ashes cleans the plates of all grease and tends to soften and liven up the amalgam.

ELECTRICAL UNITS

VOLT—The unit of electrical motive force. Force required to send one ampere of current through one ohm of resistance.

OHM—Unit of resistance. The resistance offered to the passage of one ampere, when impelled by one volt.

AMPERE—Unit of current. The current which one volt can send through a resistance of one ohm.

COULOMB—Unit of quantity. Quantity of current which, impelled by one volt, would pass through one ohm in one second.

FARAD—Unit of capacity. A conductor or condenser which will hold one coulomb under the pressure of one volt.

JOULE—Unit of work. The work done by one watt in one second.

WATT—The unit of electrical energy, and is the product of ampere and volt. That is, one ampere of current flowing under a pressure of one volt gives one watt of energy.

One electrical horsepower is equal to 746 watts.

One kilowatt is equal to 1,000 watts.

To find the watts consumed in a given electrical circuit, such as a lamp, multiply the volts by the amperes.

Tn find the volts, divide the watts by the amperes.

To find the amperes, divide the watts by the volts.

To find the electrical horsepower required by a lamp, divide the watts of the lamp by 746.

To find the number of lamps that can be supplied by one electrical horsepower of energy, divide 746 by the watts of the lamp.

To find the electrical horsepower necessary, multiply the watts per lamp by the number of lamps, and divide by 746.

To find the mechanical horsepower necessary to generate the required electrical horsepower, divide the latter by the efficiency of the generator.

To find the amperes of a given circuit, of which the volts and ohms resistance are known, divide the volts by the ohms.

To find the volts, when the amperes and watts are known, multiply the amperes by the ohms.

To find the resistance in ohms, when the volts and amperes are known, divide the volts by the amperes.

USEFUL INFORMATION

CIRCUMFERENCE AND AREA OF CIRCLES

Diameter	Circumference	Area	Diameter	Circumference	Area	Diameter	Circumference	Area	Diameter	Circumference	Area
⅛	.3927	.0123	10	31.41	78.54	30	94.24	706.86	65	204.2	3318.3
¼	.7854	.0491	10½	32.98	86.59	31	97.38	754.76	66	207.3	3421.2
⅜	1.178	.1104	11	34.55	95.03	32	100.5	804.24	67	210.4	3525.6
½	1.570	.1963	11½	36.12	103.86	33	103.6	855.30	68	213.6	3631.6
⅝	1.963	.3068	12	37.69	113.09	34	106.8	907.92	69	216.7	3739.2
¾	2.356	.4418	12½	39.27	122.71	35	109.0	962.11	70	219.9	3848.4
⅞	2.748	.6013	13	40.84	132.73	36	113.0	1017.8	71	223.0	3959.2
1	3.141	.7854	13½	42.41	143.13	37	116.2	1075.2	72	226.1	4071.5
1⅛	3.534	.9940	14	43.98	153.93	38	119.3	1134.1	73	229.3	4185.4
1¼	3.927	1.227	14½	45.55	165.13	39	122.5	1194.5	74	232.4	4300.8
1⅜	4.319	1.484	15	47.12	176.71	40	125.6	1256.6	75	235.6	4417.8
1½	4.712	1.767	15½	48.69	188.69	41	128.8	1320.2	76	238.7	4536.4
1⅝	5.105	2.073	16	50.26	201.06	42	131.9	1385.4	77	241.9	4656.6
1¾	5.497	2.405	16½	51.83	213.82	43	135.0	1452.2	78	245.0	4778.3
1⅞	5.890	2.761	17	53.40	226.98	44	138.2	1520.5	79	248.1	4901.6
2	6.283	3.141	17½	54.97	240.52	45	141.3	1590.4	80	251.3	5026.5
2¼	7.068	3.976	18	56.54	254.46	46	144.5	1661.9	81	254.4	5153.0
2½	7.854	4.908	18½	58.11	268.80	47	147.6	1734.9	82	257.6	5281.0
2¾	8.639	5.939	19	59.69	283.52	48	150.7	1809.5	83	260.7	5410.6
3	9.424	7.068	19½	61.26	298.64	49	153.9	1885.7	84	263.8	5541.7
3¼	10.21	8.295	20	62.83	314.16	50	157.0	1963.5	85	267.0	5674.5
3½	10.99	9.621	20½	64.40	330.06	51	160.2	2042.8	86	270.1	5808.8
3¾	11.78	11.044	21	65.97	346.36	52	163.3	2123.7	87	273.3	5944.6
4	12.56	12.566	21½	67.54	363.05	53	166.5	2206.1	88	276.4	6082.1
4½	14.13	15.904	22	69.11	380.13	54	169.6	2290.2	89	279.6	6221.1
5	15.70	19.635	22½	70.68	397.60	55	172.7	2375.8	90	282.7	6361.7
5½	17.27	23.758	23	72.25	415.47	56	175.9	2463.0	91	285.8	6503.9
6	18.84	28.274	23½	73.82	433.73	57	179.0	2551.7	92	289.0	6647.6
6½	20.42	33.183	24	75.39	452.39	58	182.2	2642.0	93	292.1	6792.9
7	21.99	38.484	24½	76.96	471.43	59	185.3	2733.9	94	295.3	6939.8
7½	23.56	44.178	25	78.54	490.87	60	188.4	2827.4	95	298.4	7088.2
8	25.13	50.265	26	81.68	530.93	61	191.6	2922.4	96	301.5	7238.2
8½	26.70	56.745	27	84.82	572.55	62	194.7	3019.0	97	304.7	7389.8
9	28.27	63.617	28	87.96	615.75	63	197.9	3117.2	98	307.8	7542.9
9½	29.84	70.882	29	91.10	660.52	64	201.0	3216.9	99	311.0	7697.7

To compute the circumference of a diameter greater than any in the above table:

Rule.—Divide the dimension by 2, 3, 4, etc., if practicable, until it is reduced to a diameter to be found in table. Take the tabular circumference of this diameter, multiply it by 2, 3, 4, etc., according as it was divided, and the product will be the circumference required.

Example.—What is the circumference of a diameter of 125? $125 \div 5 = 25$. Tabular circumference of $25 = 78.54 \times 5 = 392.7$, circumference required.

COMPARISON OF WIRE AND SHEET METAL GAUGES

No. of Gauge	Brown and Sharpe's		Bir'ham		Roebling's or Washburn and Moen's	Trenton Iron Company	U. S. Legal Standard	British Imperial and Legal Standard	Zinc Number	Old English	No. of Gauge
	Inches	Nearest Millimeter Dimensions	Wire or Stubs Gauge	Sheet Metal Gauge							
			In.	In.	In.	In.	In.	In.	In.		
7|0					.490		.50000	.500			7|0
6|0					.460		.46875	.464			6|0
5|0					.430	.450	.43750	.432			5|0
4|0	.46000	11.683	.454		.393	.400	.40625	.400		.454	4|0
3|0	.40964	10.405	.425		.362	.360	.37500	.372		.425	3|0
2|0	.36480	9.266	.380		.331	.330	.34375	.348		.380	2|0
0	.32486	8.251	.340		.307	.305	.31250	.324		.340	0
1	.28930	7.348	.300	.0085	.283	.285	.28125	.300	.002	.300	1
2	.25763	6.544	.284	.0095	.263	.265	.265625	.276	.004	.284	2
3	.22942	5.827	.259	.0105	.244	.245	.25000	.252	.006	.259	3
4	20431	5.189	.238	.012	.225	.225	.234375	.232	.008	.238	4
5	.18194	4.621	.220	.014	.207	.205	.21875	.212	.010	.220	5
6	.16202	4.115	.203	.016	.192	.190	.203125	.192	.012	.203	6
7	.14428	3.665	.180	.019	.177	.175	.18750	.176	.014	.180	7
8	.12849	3.264	.165	.021	.162	.160	.171875	.160	.016	.165	8
9	.11442	2.906	.148	.023	.148	.145	.15625	.144	.018	.148	9
10	.10190	2.588	.134	.027	.135	.130	.140625	.128	.020	.134	10
11	.09074	2.305	.120	.031	.120	.1175	.12500	.116	.024	.120	11
12	.08081	2.053	.109	.035	.105	.105	.109375	.104	.028	.109	12
13	.07196	1.828	.095	.038	.092	.0925	.09375	.092	.032	.095	13
14	.06408	1.628	.083	.042	.080	.080	.078125	.080	.036	.083	14
15	.05707	1.449	.072	.047	.072	.070	.0703125	.072	.040	.072	15
16	.05082	1.290	.065	.051	.063	.061	.06250	.064	.045	.065	16
17	.04526	1.150	.058	.055	.054	.0525	.05625	.056	.050	.058	17
18	.04030	1.024	.049	.060	.047	.045	.05000	.048	.055	.049	18
19	.03589	.9116	.042	.063	.041	.040	.04375	.040	.060	.040	19
20	.03196	.8118	.035	.065	.035	.035	.03750	.036	.070	.035	20
21	.02846	.7229	.032	.068	.032	.031	.034375	.032	.080	.0315	21
22	.02535	.6439	.028	.072	.028	.028	.03125	.028	.090	.0295	22
23	.02257	.5733	.025	.077	.025	.025	.028125	.024	.100	.027	23
24	02010	.5105	.022	.082	.023	.0225	.02500	.022	.125	.025	24
25	.01790	.4547	.020	.090	.020	.020	.021875	.020	.250	.023	25
26	.01594	.4049	.018	.100	.018	.018	.01875	.018	.375	.0205	26
27	.01419	.3604	.016	.112	.017	.017	.0171875	.0164	.500	.01875	27
28	.01264	.32106	.014	.124	.016	.016	.015625	.0148	1.000	.0165	28
29	.01126	.2860	.013	.136	.015	.015	.0140625	.0136		.0155	29
30	.01002	.2545	.012	.150	.014	.014	.01250	.0124		.01375	30
31	.00893	.2268	.010	.166	.0135	.013	.0109375	.0116		.01225	31
32	.00795	.2019	.009	.182	.013	.012	.01015625	.0108		.01125	32
33	.00708	.1798	.008	.200	.011	.011	.009375	.0100		.01025	33
34	.00630	.1600	.007	.216	.010	.010	.00859375	.0092		.0095	34
35	.00561	.1425	.005	.238	.0095	.0095	.0078125	.0084		.0090	35
36	.00500	.1270	.004	.250	.009	.009	.00703125	.0076		.0075	36
37	.00445	.1130		.270	.0085	.0085	.006640625	.0068		.0065	37
38	.00396	.1006		.278	.008	.008	.00625	.0060		.00575	38
39	.00353	.0897		.289	.0075	.0075		.0052		.005	39
40	.00314	.0798		.300	.007	.007		.0048		.0045	40
41	.00280	.0711						.0044			41
42	.00249	.0632						.0040			42

THE VALUE OF GOLD PER TROY OUNCE AT DIFFERENT DEGREES OF FINENESS, BASED ON $20.6718 PER OUNCE FOR 1000 FINE U. S. CURRENCY

Fine	$	Cents	Fine	$	Cents	Fine	$	Cents	Fine	$	Cents
10		20.67	260	5	37.47	510	10	54.26	760	15	71.06
20		41.34	270	5	58.14	520	10	74.94	770	15	91.73
30		62.02	280	5	78.81	530	10	95.61	780	16	12.40
40		82.69	290	5	99.48	540	11	16.28	790	16	33.07
50	1	03.36	300	6	20.16	550	11	36.95	800	16	53.75
60	1	24.03	310	6	40.83	560	11	57.62	810	16	74.42
70	1	44.70	320	6	61.50	570	11	78.29	820	16	95.09
80	1	65.37	330	6	82.17	580	11	98.97	830	17	15.76
90	1	86.05	340	7	02.84	590	12	19.64	840	17	36.43
100	2	06.72	350	7	23.51	600	12	40.31	850	17	57.11
110	2	27.39	360	7	44.19	610	12	60.98	860	17	77.78
120	2	48.06	370	7	64.86	620	12	81.65	870	17	98.45
130	2	68.73	380	7	85.53	630	13	02.33	880	18	19.12
140	2	89.41	390	8	06.20	640	13	23.00	890	18	89.79
150	3	10.08	400	8	26.87	650	13	43.67	900	18	60.46
160	3	30.75	410	8	47.55	660	13	64.34	910	18	81.14
170	3	51.42	420	8	68.22	670	13	85.01	920	19	01.81
180	3	72.09	430	8	88.89	680	14	05.68	930	19	22.48
190	3	92.76	440	9	09.56	690	14	26.36	940	19	43.15
200	4	13.44	450	9	30.23	700	14	47.03	950	19	63.82
210	4	34.11	460	9	50.90	710	14	67.70	960	19	84.50
220	4	54.78	470	9	71.58	720	14	88.37	970	20	05.17
230	4	75.45	480	9	92.25	730	15	09.04	980	20	25.84
240	4	96.12	490	10	12.92	740	15	29.72	990	20	46.51
250	5	16.80	500	10	33.59	750	15	50.39	1000	20	67.18

WHY ONE OUNCE OF FINE GOLD IS WORTH $20.67

One dollar in gold coin weighs.....25.8 grains Troy

Ten per cent. is alloy (copper)..... 2.58 grains Troy

Therefore the weight of pure gold in a gold dollar is....23.22 grains Troy

There are 480 grains in a Troy ounce. Therefore 480÷23.22=20.67, or the value per Troy ounce is $20.67.

As an example: $800.00 in gold coin weighs 43 ozs. Troy; 90 per cent. is fine gold, or 38.7 ounces; $800.00 divided by 38.7 gives a value of $20.67 per ounce.

REFERENCE TABLES

TABLE FOR ESTIMATING THE VALUE OF SILVER PER TROY OUNCE AT DIFFERENT DEGREES OF FINENESS, BASED $0.50 PER OUNCE 1000 FINE.

U. S. CURRENCY

To find the present market value of silver at any given time, add 2% for every 1c above 50c. Example: To estimate the value of 1 ounce of silver 750 fine, presuming the market value of silver is 63c. per ounce for silver 1000 fine, which is 13 cents, or 26% above the computed value in table below, thus: One ounce of silver 750 fine is worth 37½c+26% = 47¼c.

Fine	Cents	Fine	Cents
10	00.50	510	25.50
20	01	520	26
30	01.50	530	26.50
40	02	540	27
50	02.50	550	27.50
60	03	560	28
70	03.50	570	28.50
80	04	580	29
90	04.50	590	29.50
100	05	600	30
110	05.50	610	30.50
120	06	620	31
130	06.50	630	31.50
140	07	640	32
150	07.50	650	32.50
160	08	660	33
170	08.50	670	33.50
180	09	680	34
190	09.50	690	34.50
200	10	700	35
210	10.50	710	35.50
220	11	720	36
230	11.50	730	36.50
240	12	740	37
250	12.50	750	37.50
260	13	760	38
270	13.50	770	38.50
280	14	780	39
290	14.50	790	39.50
300	15	800	40
310	15.50	810	40.50
320	16	820	41
330	16.50	830	41.50
340	17	840	42
350	17.50	850	42.50
360	18	860	43
370	18.50	870	43.50
380	19	880	44
390	19.50	890	44.50
400	20	900	45
410	20.50	910	45.50
420	21	920	46
430	21.50	930	46.50
440	22	940	47
450	22.50	950	47.50
460	23	960	48
470	23.50	970	48.50
480	24	980	49
490	24.50	990	49.50
500	25	1000	50

COMPARISON

OF FAHRENHEIT, CENTIGRADE AND REAUMUR THERMOMETERS

C. Water freezes at 0°
Water boils at 100°

F. Water freezes at 32°
Water boils at 212°

R. Water freezes at 0°
Water boils at 80°

Fahrenheit = 9–5 Centi. + 32 = 9–4 Reau. + 32	Centigrade = 5–4 Reau. = 5–9 (Fahr.—32)	Reaumur = 4–5 Centi. = 4–9 (Fahr.—32)	Fahr.	Cent.	Reau.	Fahr.	Cent.	Reau.
			150	65.6	52.4	46	7.8	6.2
			148	64.4	51.6	44	6.7	5.3
			146	63.3	50.7	42	5.6	4.4
			144	62.2	49.8	40	4.4	3.6
			142	61.1	48.9	38	3.3	2.7
			140	60	48	36	2.2	1.8
			138	58.9	47.1	34	1.1	0.9
932	500	400	136	57.8	46.2	32	0	0
800	426.7	341.3	134	56.7	45.3	30	–1.1	–0.9
752	400	320	132	55.6	44.4	28	–2.2	–1.8
700	371.1	296.9	130	54.4	43.6	26	–3.3	–2.7
662	350	280	128	53.3	42.7	24	–4.4	–3.6
600	315.5	252.4	126	52.2	41.8	22	–5.6	–4.4
572	300	240	124	51.1	40.9	20	–6.7	–5.3
500	260	208	122	50	40	18	–7.8	–6.2
464	240	192	120	48.9	39.1	16	–8.9	–7.1
392	200	160	118	47.8	38.2	14	–10	–8
350	176.7	141.4	116	46.7	37.3	12	–11.1	–8.9
302	150	120	114	45.6	36.4	10	–12.1	–9.8
300	148.9	119.2	112	44.4	35.6	8	–13.3	–10.7
250	121.1	96.9	110	43.3	34.7	6	–14.4	–11.6
212	100	80	108	42.2	33.8	4	–15.6	–12.4
210	98.9	79.1	106	41.1	32.9	2	–16.7	–13.3
208	97.8	78.2	104	40	32	0	–17.8	–14.2
206	96.7	77.3	102	38.9	31.1	–2	–18.9	–15.1
204	95.6	76.4	100	37.8	30.2	–4	–20	–16
202	94.4	75.6	98	36.7	29.3	–6	–21.1	–16.9
200	93.3	74.7	96	35.6	28.4	–8	–22.2	–17.8
198	92.2	73.8	94	34.4	27.6	–10	–23.3	–18.7
196	91.1	72.9	92	33.3	26.7	–12	–24.4	–19.6
194	90	72	90	32.2	25.8	–14	–25.6	–20.4
192	88.9	71.1	88	31.1	24.9	–16	–26.7	–21.3
190	87.8	70.2	86	30	24	–18	–27.8	–22.2
188	86.7	69.3	84	28.9	23.1	–20	–28.9	–23.1
186	85.6	68.4	82	27.8	22.2	–22	–30	–24
184	84.4	67.6	80	26.7	21.3	–24	–31.1	–24.9
182	83.3	66.7	78	25.6	20.4	–26	–32.2	–25.8
180	82.2	65.8	76	24.4	19.6	–28	–33.3	–26.7
178	81.1	64.9	74	23.3	18.7	–30	–34.4	–27.6
176	80	64	72	22.2	17.8	–32	–35.6	–28.4
174	78.9	63.1	70	21.1	16.9	–34	–36.7	–29.3
172	77.8	62.2	68	20	16	–36	–37.8	–30.2
170	76.7	61.3	66	18.9	15.1	–38	–38.9	–31.1
168	75.6	60.4	64	17.8	14.2	–40	–40	–32
166	74.4	59.6	62	16.7	13.3	–42	–41.1	–32.9
164	73.3	58.7	60	15.6	12.4	–44	–42.2	–33.8
162	72.2	57.8	58	14.4	11.6	–46	–43.3	–34.7
160	71.1	56.9	56	13.3	10.7	–48	–44.4	–35.6
158	70	56	54	12.2	9.8	–50	–45.6	–36.4
156	68.9	55.1	52	11.1	8.9	–52	–46.7	–37.3
154	67.8	54.2	50	10	8	–54	–47.8	–38.2
152	66.7	53.3	48	8.9	7.1	–56	–48.9	–39.1

USEFUL INFORMATION

WATER

Doubling the diameter of a pipe increases its capacity four times. Friction of liquids in pipes increases as the square of the velocity.

To find the pressure in pounds per square inch of a column of water, multiply the height of the column in feet by .434. Approximately, we say that every foot elevation is equal to ½ pound pressure per square inch; this allows for ordinary friction.

To find the diameter of a pump cylinder to remove a given quantity of water per minute (100 feet of piston being the standard of speed), divide the number of gallons by 4, then extract the square root, and the product will be the diameter in inches of the pump cylinder.

To find the quantity of water elevated in one minute, running at 100 feet of piston speed per minute, square the diameter of the water cylinder in inches, and multiply by 4.

Example—Capacity of a 5-inch cylinder is desired. The square of the diameter (5 inches) is 25, which, multiplied by 4, gives 100, the number of gallons per minute (approximately).

To find the horsepower necessary to elevate water to a given height, multiply the weight of the water elevated per minute in pounds by the height in feet, and divide the product by 33,000 (an allowance should be added for water friction, and a further allowance for loss in steam cylinder, say from 20 to 30 per cent).

The area of the steam piston, multiplied by the steam pressure, gives the total amount of pressure that can be exerted. The area of the water piston, multiplied by the pressure of water per square inch, gives the resistance. A margin must be made between the power and the resistance to move the pistons at the required speed, say from 20 to 40 per cent, according to speed and other conditions.

To find the capacity of a cylinder in gallons, multiply the area in inches by the length of stroke in inches, will give the total number of cubic inches; divide this amount by 231 (which is the cubical contents of a U. S. gallon in inches), and product is the capacity in gallons.

One cubic foot of water when converted into steam expands to 1728 cubic feet at atmospheric pressure.

The mean pressure of the atmosphere is usually estimated at 14.7 lbs. per square inch, so that with a perfect vacuum it will sustain a column of mercury 29.9 in., or a column of water 33.9 ft. high.

TO COMPUTE ALTITUDE BY BOILING POINT OF WATER

$517\ (212°—T) + 212°—T)^2 = \text{Height}.$

Illustration—What is the height of an elevation, when boiling point of water is 182° F.?

$517 \times (212°—182°) + 212°—182°)^2 = 517 \times 30 + 30^2 = 16{,}410$ feet.

Corrections for temperature of atmosphere to be made in connection with formula.

Temperature Deg. Fahr.	Correction	Temperature Deg. Fahr.	Correction	Temperature Deg. Fahr.	Correction	Temperature Deg. Fahr.	Correction
0	.936	28	.992	56	1.050	84	1.108
2	.940	30	.996	58	1.054	86	1.112
4	.944	32	1.000	60	1.058	88	1.116
6	.948	34	1.004	62	1.062	90	1.120
8	.952	36	1.008	64	1.066	92	1.124
10	.956	38	1.012	66	1.071	94	1.128
12	.960	40	1.016	68	1.075	96	1.132
14	.964	42	1.020	70	1.079	98	1.136
16	.968	44	1.024	72	1.083	100	1.140
18	.972	46	1.028	74	1.087	102	1.144
20	.976	48	1.032	76	1.091	104	1.148
22	.980	50	1.036	78	1.096	106	1.152
24	.984	52	1.041	80	1.100	------	--------
26	.988	54	1.046	82	1.104	------	--------

Illustration.—Assume temperature of atmosphere in preceding illustration to have been 80° F.

Then $16410 \times 1.1 = 18{,}051$ feet.

TABLE—TEMPERATURE OF BOILING WATER. CORRESPONDING TO THE HEIGHT OF BAROMETER AND ALTITUDE ABOVE SEA LEVEL

Thermo. Degrees	Baro. Inches	Alti. Feet	Thermo. Degrees	Baro. Inches	Alti. Feet	Thermo. Degrees	Baro. Inches	Alti. Feet
184.0	16.79	15221	194.0	20.82	9579	204.0	25.59	4169
.2	16.86	15112	.2	20.91	9466	.2	25.70	4057
.4	16.93	15003	.4	21.00	9353	.4	25.88	3945
.6	17.00	14895	.6	21.09	9241	.6	25.91	3844
.8	17.08	14772	.8	21.18	9130	.8	26.01	3742
185.0	17.15	14649	195.0	21.26	9031	205.0	26.11	3642
.2	17.23	14543	.2	21.35	8920	.2	26.22	3532
.4	17.31	14421	.4	21.44	8810	.4	26.33	3422
.6	17.38	14315	.6	21.53	8700	.6	26.43	3322
.8	17.46	14195	.8	21.62	8590	.8	26.54	3213
186.0	17.54	14075	196.0	21.71	8481	206.0	26.64	3115
.2	17.62	13956	.2	21.81	8361	.2	26.75	3007
.4	17.70	13837	.4	21.90	8253	.4	26.86	2899
.6	17.78	13718	.6	21.99	8145	.6	26.97	2792
.8	17.86	13601	.8	22.08	8038	.8	27.08	2685
187.0	17.93	13498	197.0	22.17	7932	207.0	27.18	2589
.2	18.00	13396	.2	22.27	7814	.2	27.29	2483
.4	18.08	13280	.4	22.36	7708	.4	27.40	2377
.6	18.16	13164	.6	22.45	7602	.6	27.51	2272
.8	18.24	13049	.8	22.54	7498	.8	27.62	2167
188.0	18.32	12934	198.0	22.64	7381	208.0	27.73	2063
.2	18.40	12820	.2	22.74	7266	.2	27.84	1959
.4	18.48	12706	.4	22.84	7151	.4	27.95	1856
.6	18.56	12593	.6	22.93	7048	.6	28.06	1753
.8	18.64	12480	.8	23.02	6945	.8	28.17	1650
189.0	18.72	12367	199.0	23.11	6843	209.0	28.29	1539
.2	18.80	12256	.2	23.21	6729	.2	28.40	1437
.4	18.88	12144	.4	23.31	6617	.4	28.51	1336
.6	18.96	12033	.6	23.40	6516	.6	28.62	1235
.8	19.04	11923	.8	23.49	6415	.8	28.73	1134
190.0	19.13	11799	200.0	23.59	6304	210.0	28.85	1025
.2	19.21	11690	.2	23.69	6193	.2	28.97	916
.4	19.29	11581	.4	23.79	6082	.4	29.09	808
.6	19.37	11472	.6	23.89	5972	.6	29.20	709
.8	19.45	11364	.8	23.98	5874	.8	29.31	610
191.0	19.54	11243	201.0	24.08	5764	211.0	29.42	512
.2	19.62	11136	.2	24.18	5656	.2	29.54	405
.4	19.70	11029	.4	24.28	5547	.4	29.65	308
.6	19.78	10923	.6	24.38	5440	.6	29.77	202
.8	19.87	10804	.8	24.48	5332	.8	29.88	105
192.0	19.96	10685	202.0	24.58	5225	212.0	30.00	sea level
.2	20.05	10567	.2	24.68	5119	below	sea	level
.4	20.14	10450	.4	24.78	5013	.2	30.12	—104
.6	20.22	10346	.6	24.88	4907	.4	30.24	—206
.8	20.31	10230	.8	24.98	4802	.6	30.35	—304
						.8	30.47	—405
193.0	20.39	10127	203.0	25.08	4697			
.2	20.48	10011	.2	25.18	4593	213.0	30.59	—512
.4	20.57	9896	.4	25.28	4489	.2	30.71	—613
.6	20.65	9794	.6	25.38	4386	.4	30.82	—714
.8	20.73	9693	.8	25.49	4272	.6	30.93	—813

TABLE OF BEAUMÉ'S HYDROMETERS WITH CORRESPONDING SPECIFIC GRAVITY, AND ALSO THE NUMBER OF POUNDS CONTAINED IN ONE U. S. GALLON AT 60° F.

FOR LIQUID LIGHTER THAN WATER

Be.	Sp. Gr.	Lbs. in Gallon	Be.	Sp. Gr.	Lbs. in Gallon	Be.	Sp. Gr.	Lbs. in Gallon	Be.	Sp. Gr.	Lbs. in Gallon
10	1.0000	8.33	30	0.8750	7.29	50	0.7777	6.48	70	0.7000	5.83
11	0.9929	8.27	31	0.8695	7.24	51	0.7734	6.44	71	0.6965	5.80
12	0.9859	8.21	32	0.8641	7.20	52	0.7692	6.41	72	0.6930	5.78
13	0.9790	8.16	33	0.8588	7.15	53	0.7650	6.37	73	0.6896	5.75
14	0.9722	8.10	34	0.8536	7.11	54	0.7608	6.34	74	0.6863	5.72
15	0.9655	8.04	35	0.8484	7.07	55	0.7567	6.30	75	0.6829	5.69
16	0.9589	7.99	36	0.8433	7.03	56	0.7526	6.27	76	0.6796	5.66
17	0.9523	7.93	37	0.8383	6.98	57	0.7486	6.24	77	0.6763	5.63
18	0.9459	7.88	38	0.8333	6.94	58	0.7446	6.20	78	0.6730	5.60
19	0.9395	7.83	39	0.8284	6.90	59	0.7407	6.17	79	0.6698	5.58
20	0.9333	7.78	40	0.8235	6.86	60	0.7368	6.14	80	0.6666	5.55
21	0.9271	7.72	41	0.8187	6.82	61	0.7329	6.11	81	0.6635	5.52
22	0.9210	7.67	42	0.8139	6.78	62	0.7290	6.07	82	0.6604	5.50
23	0.9150	7.62	43	0.8092	6.74	63	0.7253	6.04	83	0.6573	5.48
24	0.9090	7.57	44	0.8045	6.70	64	0.7216	6.01	84	0.6542	5.45
25	0.9032	7.53	45	0.8000	6.66	65	0.7179	5.98	85	0.6511	5.42
26	0.8974	7.48	46	0.7954	6.63	66	0.7142	5.95	86	0.6481	5.40
27	0.8917	7.43	47	0.7909	6.59	67	0.7106	5.92	87	0.6451	5.38
28	0.8860	7.38	48	0.7865	6.55	68	0.7070	5.89	88	0.6422	5.36
29	0.8805	7.34	49	0.7821	6.52	69	0.7035	5.86	89	0.6392	5.33
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TABLE OF BEAUMÉ'S HYDROMETERS WITH CORRESPONDING SPECIFIC GRAVITIES

FOR LIQUIDS HEAVIER THAN WATER

TEMPERATURE 60° FAHRENHEIT

Beaume	Specific Gravity	Beaume	Specific Gravity	Beaume	Specific Gravity	Beaume	Specific Gravity
1	1.0069	19	1.1507	37	1.3425	55	1.611
2	1.0139	20	1.1600	38	1.3551	56	1.6292
3	1.0211	21	1.1693	39	1.3679	57	1.6477
4	1.0283	22	1.1788	40	1.3809	58	1.6666
5	1.0357	23	1.1885	41	1.3942	59	1.6860
6	1.0431	24	1.1983	42	1.4077	60	1.7056
7	1.0507	25	1.2083	43	1.4215	61	1.7261
8	1.0583	26	1.2184	44	1.4356	62	1.7469
9	1.0661	27	1.2288	45	1.4500	63	1.7682
10	1.0740	28	1.2393	46	1.4646	64	1.7901
11	1.0820	29	1.2500	47	1.4795	65	1.8125
12	1.0902	30	1.2608	48	1.4949	66	1.8354
13	1.0984	31	1.2719	49	1.5104	67	1.8539
14	1.1068	32	1.2831	50	1.5263	68	1.8831
15	1.1153	33	1.2946	51	1.5425	69	1.9079
16	1.1240	34	1.3063	52	1.5591	70	1.9333
17	1.1328	35	1.3181	53	1.5760	----	----------
18	1.1417	36	1.3302	54	1.5934	----	----------

NORMAL SOLUTIONS

TABLE FOR MAKING NORMAL SOLUTIONS

		Molecular Weight	Grams per Litre
Ammonia	NH_3	17	17.00
Arsenious Acid	As_2O_3	198	49.5
Hydrochloric Acid	HCl	36.37	36.37
Iodine	I	126.9	126.90
Nitric Acid	HNO_3	63	63.00
Oxalic Acid	$H_2C_2O_4.2H_2O$	126.04	63.02
Potassium Hydrate	KOH	56	56.00
Potassium Permanganate	$K_2Mn_2O_8$	316.3	31.63
Silver Nitrate	$AgNO_3$	169.9	169.90
Sodium Carbonate	Na_2CO_3	106.1	53.05
Sodium Chloride	$NaCl$	58.5	58.50
Sodium Hydrate	$NaOH$	40	40.00
Sodium Thiosulphate	$Na_2S_2O_3.5H_2O$	248.2	248.2
Sulphuric Acid	H_2SO_4	98.03	49.15

Courtesy of Western Chemical Mfg. Co.

REFERENCE TABLE

COMPARISON OF BRIX, BEAUMÉ, AND SP. GRAV. SCALES

Brix.	Be.	Sp. Gr.	Brix.	Be.	Sp. Gr.	Brix.	Be.	Sp. Gr.
0.0	0.0	1.0000	.1	2.3	1.01610	.2	4.6	1.03270
.1	.1	1.00038	.2	2.4	1.01650	.3	4.7	1.03311
.2	.1	1.00077	.3	2.4	1.01690	.4	4.8	1.03352
.3	.2	1.00116	.4	2.5	1.01730	.5	4.8	1.03393
.4	.2	1.00155	.5	2.5^5	1.01770	.6	4.9	1.03434
.5	.3	1.00193	.6	2.6	1.01810	.7	4.9	1.03475
.6	.3	1.00232	.7	2.7	1.01850	.8	5.0	1.03517
.7	.4	1.00271	.8	2.7	1.01890	.9	5.0	1.03558
.8	.45	1.00310	.9	2.8	1.01930	9.0	5.1	1.03599
.9	.5	1.00349	5.0	2.8	1.01970	.1	5.2	1.03640
1.0	.6	1.00388	.1	2.9	1.02010	.2	5.2	1.03682
.1	.6	1.00427	.2	2.9^5	1.02051	9.3	5.3	1.03723
.2	.7	1.00466	.3	3.0	1.02091	.4	5.3	1.03765
.3	.7	1.00505	.4	3.1	1.02131	.5	5.4	1.03806
.4	.8	1.00544	.5	3.1	1.02171	.6	5.4	1.03848
.5	.85	1.00583	.6	3.2	1.02211	.7	5.5	1.03889
.6	.9	1.00622	.7	3.2	1.02252	.8	5.5^5	1.03931
.7	1.0	1.00662	.8	3.3	1.02292	.9	5.6	1.03972
.8	1.0	1.00701	.9	3.3^5	1.02333	10.0	5.7	1.04014
.9	1.1	1.00740	6.0	3.4	1.02373	.1	5.7	1.04055
2.0	1.1	1.00779	.1	3.5	1.02413	.2	5.8	1.04097
.1	1.2	1.00818	6.2	3.5	1.02454	.3	5.8	1.04139
.2	1.2	1.00858	.3	3.6	1.02494	.4	5.9	1.04180
.3	1.3	1.00897	.4	3.6	1.02535	.5	5.9	1.04222
.4	1.4	1.00936	.5	3.7	1.02575	.6	6.0	1.04264
.5	1.4	1.00976	.6	3.7	1.02616	.7	6.1	1.04306
.6	1.5	1.01015	.7	3.8	1.02657	.8	6.1	1.04348
.7	1.5	1.01055	.8	3.9	1.02694	.9	6.2	1.04390
.8	1.6	1.01094	.9	3.9	1.02738	11.0	6.2	1.04431
.9	1.6	1.01134	7.0	4.0	1.02779	.1	6.3	1.04473
3.0	1.7	1.01173	.1	4.0	1.02819	.2	6.3	1.04515
3.1	1.8	1.01213	.2	4.1	1.02860	.3	6.4	1.04557
.2	1.8	1.01252	.3	4.1	1.02901	.4	6.5	1.04599
.3	1.9	1.01292	.4	4.2	1.02942	.5	6.5	1.04641
.4	1.9	1.01332	.5	4.25	1.02983	.6	6.6	1.04683
.5	2.0	1.01371	.6	4.3	1.03024	.7	6.6	1.04726
.6	2.0	1.01411	.7	4.4	1.03064	.8	6.7	1.04768
.7	2.1	1.01451	.8	4.4	1.03105	.9	6 7	1.04810
.8	2.2	1.01491	.9	4.5	1.03146	12.0	6.8	1.04852
.9	2.2	1.01531	8.0	4.5	1.03187	.1	6.8	1.04894
4.0	2.3	1.01570	.1	4.6	1.03228	.2	6.9	1.04937

REFERENCE TABLE—Continued

Brix.	Be.	Sp. Gr.	Brix.	Be.	Sp. Gr.	Brix.	Be.	Sp. Gr.
.3	7.0	1.04979	.8	9.5	1.06914	.3	12.0	1.08914
12.4	7.0	1.05021	.9	9.5	1.06958	.4	12.0	1.08959
.5	7.1	1.05064	17.0	9.6	1.07002	.5	12.1	1.09004
.6	7.1	1.05106	.1	9.7	1.07046	.6	12.1	1.09049
.7	7.2	1.05149	.2	9.7	1.07090	.7	12.2	1.09095
.8	7.2	1.05191	.3	9.8	1.07133	.8	12.3	1.09140
.9	7.3	1.05233	.4	9.8	1.07177	.9	12.3	1.09185
13.0	7.4	1.05276	.5	9.9	1.07221	22.0	12.4	1.09231
.1	7.4	1.05318	.6	9.9	1.07265	.1	12.5	1.09276
.2	7.5	1.05361	.7	10.0	1.07309	.2	1.25	1.09321
.3	7.5	1.05404	.8	10.0	1.07353	.3	12.6	1.09367
.4	7.6	1.05446	.9	10.1	1.07397	.4	12.6	1.09412
.5	7.6	1.05489	18.0	10.1	1.07441	.5	12.7	1.09458
.6	7.7	1.05532	.1	10.2	1.07485	22.6	12.7	1.09503
.7	7.7⁵	1.05574	.2	10.3	1.07530	.7	12.8	1.09549
.8	7.8	1.05617	.3	10.3	1.07574	.8	12.8⁵	1.09595
.9	7.9	1.05660	.4	10.4	1.07168	.9	12.9	1.09640
14.0	7.9	1.05703	.5	10.4	1.07662	23.0	13.0	1.09686
.1	8.0	1.05746	.6	10.5	1.07706	.1	13.0	1.09732
.2	8.0	1.05789	.7	10.5	1.07751	.2	13.1	1.09777
.3	8.1	1.05831	.8	10.6	1.07795	.3	13.1	1.09823
.4	8.1	1.05874	.9	10.6	1.07839	.4	13.2	1.09869
.5	8.2	1.05917	19.0	10.7	1.07884	.5	13.2	1.09915
.6	8.3	1.05960	.1	10.8	1.07928	.6	13.3	1.09961
.7	8.3	1.06003	19.2	10.8	1.07973	.7	13.3	1.10007
.8	9.4	1.06047	.3	10.9	1.08017	.8	13.4	1.10053
.9	8.4	1.06090	.4	10.9	1.08062	.9	13.5	1.10099
15.0	8.5	1.06133	.5	11.	1.08106	24.0	13.5	1.10145
.1	8.5	1.06177	.6	11.1	1.08151	.1	13.6	1.10191
.2	8.5⁵	1.06219	.7	11.1	1.08196	.2	13.6	1.10237
.3	8.6	1.06262	.8	11.2	1.08240	.3	13.7	1.10283
.4	8.7	1.06306	.9	11.2	1.08285	.4	13.7	1.10329
.5	8.8	1.06349	20.0	11.3	1.08329	.5	13.8	1.10375
.6	8.8	1.06392	.1	11.3	1.08374	.6	13.8	1.10421
.7	8.9	1.06436	.2	11.4	1.08419	.7	13.9	1.10468
15.8	8.9	1.06479	.3	11.5	1.08464	.8	14.0	1.10514
.9	9.0	1.06522	.4	11.5	1.08509	.9	14.0	1.10560
16.0	9.0	1.06560	.5	11.6	1.08553	25.0	14.1	1.10607
.1	9.1	1.06609	.6	11.6	1.08599	.1	14.1	1.10653
.2	9.2	1.06653	.7	11.7	1.08643	.2	14.2	1.10700
.3	9.2	1.06696	.8	11.7	1.08688	.3	14.2	1.10746
.4	9.3	1.06740	.9	11.8	1.08733	.4	14.3	1.10793
.5	9.3	1.06783	21.0	11.8	1.08778	.5	14.3	1.10839
.6	9.4	1.06827	.1	11.9	1.08824	.6	14.4	1.10886
.7	9.4	1.06871	.2	11.9⁵	1.08869	.7	14.5	1.10932

REFERENCE TABLE—Concluded

Brix.	Be.	Sp. Gr.	Brix.	Be.	Sp. Gr.	Brix.	Be.	Sp. Gr.
.8	14.5	1.10979	48.5	26.9	1.22455	72.0	39.1	1.36355
.9	14.6	1.11026	49.0	27.2	1.22728	72.5	39.4	1.36675
26.0	14.6	1.11072	49.5	27.4	1.23003	73.0	39.6	1.36995
26.5	14.9	1.11306	50.0	27.7	1.23278	73.5	39.9	1.37317
27.0	15.2	1.11541	50.5	28.0	1.23555	74.0	40.1	1.37639
27.5	15.5	1.11776	51.0	28.2	1.23832	74.5	40.4	1,37962
28.0	15.7	1.12013	51.5	28.5	1.24111	75.0	40.6	1,38287
28.5	16.0	1.12250	52.0	28.8	1.24390	75.5	40.9	1.38612
29.0	16.3	1.12488	52.5	29.0	1.24670	76.0	41.1	1.38939
29.5	16.6	1.12727	53,0	29.3	1.24951	76.5	41.4	1.39266
30.0	16.8	1.12967	53.5	29.6	1.25233	77.0	41.6	1,39595
30.5	17.1	1.13207	54.0	29.8	1.25517	77.5	41.9	1.39924
31.0	17.4	1.13449	54.5	30.1	1.25801	78.0	42.1	1.40254
31.5	17.7	1.13691	55.0	30.4	1.26086	78.5	42.4	1.40586
32.0	17.9	1.13934	55.5	30.6	1.26372	79.0	42.6	1.40918
32.5	18.2	1.14178	56.0	30.9	1.26658	79.5	42.9	1.41252
33.0	18.5	1.14423	56.5	31.2	1.26946	80.0	43.1	1.41586
33.5	18.8	1.14669	57.0	31.4	1.27235	80.5	43.3	1.41921
34.0	19.0	1.14915	57.5	31.7	1.27525	81.0	43.6	1.42258
34.5	19.3	1.15163	58.0	31.9	1.27816	81.5	43.8	1.42595
35.0	19.6	1.15411	58.5	32.2	1.28107	82.0	44.1	1.42934
35.5	19.9	1.15661	59.0	32.5	1.28400	82.5	44.3	1.43273
36.0	20.1	1.15911	59.5	32.7	1.28694	83.0	44.6	1.43614
36.5	20.4	1.16162	60.0	33.0	1.28989	83.5	44.8	1.43955
37.0	20.7	1.16413	60.5	33.2	1.29284	84.0	45.1	1.44298
37.5	21.0	1.16666	61.0	33.5	1.29581	84.5	45.3	1.44641
38.0	21.2	1.16920	61.5	33.8	1.29878	85.0	45.5	1.44986
38.5	21.5	1.71174	62.0	34.0	1.30177	85.5	45.8	1.45331
39.0	21.8	1.17430	62.5	34.3	1.30476	86.0	46.0	1.45678
39.5	22.0	1.17686	63.0	34.5	1.30777	86.5	46.3	1.46026
40.0	22.3	1.17943	63.5	34.8	1.31078	87.0	46.5	1.46374
40.5	22.6	1.18201	64.0	35.1	1.31381	87.5	46.7	1.46724
41.0	22.9	1.18460	64.5	35.3	1.31684	88.0	47.0	1.47074
41.5	23.1	1.18720	65.0	35.6	1.31989	88.5	47.2	1.47426
42.0	23.4	1.18981	65.5	35.8	1.32294	89.0	47.5	1.47778
42.5	23.7	1.19243	66.0	36.1	1.32601	89.5	47.7	1.48132
43.0	23.9	1.19505	66.5	36.3	1.32908	90.0	47.9	1.48486
43.5	24.2	1.19769	67.0	36.6	1.33217	90.5	48.2	1.48842
44.0	24.5	1.20033	67.5	36.8	1.33526	91.0	48.4	1.49199
44.5	24.8	1.20299	68.0	37.1	1.33836	91.5	48.6	1.49556
45.0	25.0	1.20565	68.5	37.4	1.34148	92.0	48.9	1.49915
45.5	25.3	1.20832	69.0	37.6	1.34460	92.5	49.1	1.50274
46.0	25.6	1.21100	69.5	37.9	1.34774	93.0	49.3	1.50635
46.5	25.8	1.21369	70.0	38.1	1.35088	93.5	49.6	1.50996
47.0	26.1	1.21639	70.5	38.4	1.35403	94.0	49.8	1.51359
47.5	26.4	1.21910	71.0	38.6	1.35720	94.5	50.0	1.51722
48.0	26.6	1.22182	71.5	38.9	1.36037	95.0	50.3	1.52087

REFERENCE TABLES

COMPARISON

GAY-LUSSAC AND SPECIFIC GRAVITY HYDROMETER SCALES

G. L. Degree	Sp. Gr.	G. L. Degree	Sp. Gr.	G. L. Degree	Sp. Gr.	G. L. Degree	Sp. Gr.
100	0.795	75	0.879	50	0.936	25	0.971
99	0.800	74	0.881	49	0.938	24	0.972
98	0.805	73	0.884	48	0.940	23	0.973
97	0.810	72	0.886	47	0.941	22	0.974
96	0.814	71	0.888	46	0.943	21	0.975
95	0.818	70	0.891	45	0.945	20	0.976
94	0.822	69	0.893	44	0.946	19	0.977
93	0.826	68	0.896	43	0.948	18	0.978
92	0.829	67	0.899	42	0.949	17	0.979
91	0.832	66	0.902	41	0.951	16	0.980
90	0.835	65	0.904	40	0.953	15	0.981
89	0.838	64	0.906	39	0.954	14	0.982
88	0.842	63	0.909	38	0.956	13	0.983
87	0.845	62	0.911	37	0.957	12	0.984
86	0.848	61	0.913	36	0.959	11	0.986
85	0.851	60	0.915	35	0.960	10	0.987
84	0.854	59	0.918	34	0.962	9	0.988
83	0.857	58	0.920	33	0.963	8	0.989
82	0.860	57	0.922	32	0.964	7	0.990
81	0.863	56	0.924	31	0.965	6	0.992
80	0.865	55	0.926	30	0.966	5	0.993
79	0.868	54	0.928	29	0.967	4	0.994
78	0.871	53	0.930	28	0.968	3	0.996
77	0.874	52	0.932	27	0.969	2	0.997
76	0.876	51	0.934	26	0.970	1	0.999

TABLE OF SPECIFIC GRAVITY, ETC.

OF

PETROLEUM PRODUCTS

	Degrees of Specific Gravity	Degrees Beaume	Pounds in 1 Gallon	Pounds in 1 Cubic Foot
Rhigoline	.6222	95	5.18	38.89
Benzine or Gasoline	.6511	85	5.42	40.69
C. Naphtha	.7000	70	5.83	43.75
B. Naphtha	.7106	67	5.92	44.41
A. Naphtha	.7179	65	5.98	44.87
Kerosene Oil	.8000	45	6.66	50.00

OTHER LIGHT LIQUIDS

	Degrees of Specific Gravity	Degrees Beaume	Pounds in 1 Gallon	Pounds in 1 Cubic Foot
Water	1.0000	10	8.33	62.50
Castor Oil	.9639	15	8.03	60.24
Linseed Oil, boiled	.9411	19	7.84	58.81
Linseed Oil, raw	.9299	21	7.75	58.12
Menhaden, light	.9325	20	7.77	58.28
Menhaden, dark	.9292	21	7.74	58.08
Cotton Seed	.9302	21	7.75	58.14
Hemp Seed	.9307	20	7.75	58.17
Cod Liver	.9270	21	7.72	57.94
Whale	.9254	21	7.71	57.84
Sunflower Seed	.9250	21	7.70	57.81
Poppy Seed	.9243	21	7.70	57.77
Fish	.9205	22	7.67	57.53
Olive	.9192	22	7.65	57.45
Almond	.9180	23	7.65	57.38
Lard	.9175	23	7.64	57.34
Rape Seed	.9155	23	7.63	57.22
Neatsfoot	.9142	23	7.62	57.14
Colza	.9136	23	7.61	57.10
Palm	.9046	25	7.54	56.54
Sperm, natural	.8815	29	7.34	55.09
Sperm, bleached	.8813	29	7.34	55.08
Spirits of Turpentine	.8600	33	7.16	53.75
Alcohol, 90%	.8228	40	6.85	51.43
Alcohol, 95%	.8089	43	6.74	50.56
Alcohol, absolute	.7938	46	6.61	49.61

Note.—In the column marked Beaumé, the nearest whole number is given, omitting fractions.

USEFUL INFORMATION

TABLE OF SPECIFIC GRAVITY AND UNIT WEIGHTS

Water at 39.1° Fahrenheit = 4° Centigrade; 62.425 pounds to the cubic foot (Authority, Kent, Haswell and D. K. Clark).

	Specific Gravity	Authority	Lbs. per Cu. Ft.	Lbs. per Cu. In.	Kilos per Cu. Decem.
Aluminum, pure cast	2.56		159.63	.0924	2.56
Aluminum, pure rolled	2.68		167.11	.0967	2.68
Aluminum, pure Annealed	2.66		165.86	.0960	2.66
Aluminum, Bronze 10%	7.70	Riche	480.13	.2779	7.70
Aluminum, Bronze 5%	8.26	Riche	515.63	.2984	8.26
Brass, Cu. 67, Zn. 33, cast	8.32	Haswell	519.36	.3006	8.32
Brass, Cu. 60, Zn. 40, cast	8.405	Thurston	524.68	.3036	8.405
Cobalt	8.50	R–A	530.61	.3071	8.50
Brass, plates high yellow	8.549		533.69	.3088	8.549
Bronze composition, Cu. 90-Tin 10	8.669	Thurston	541.17	.3132	8.669
Bronze composition, Cu. 84-Tin 16	8.832	Haswell	551.34	.3191	8.832
Lithium	0.57	R–A	36.83	.0213	.57
Potassium	0.87	R–A	54.31	.0314	.87
Sodium	0.97	R–A	60.55	.0350	.97
Rubidium	1.52	R–A	94.89	.0549	1.52
Calcium	1.57	R–A	98.01	.0567	1.57
Magnesium	1.74	R–A	108.62	.0629	1.74
Caesium	1.88	R–A	117.36	.0679	1.88
Boron	2.00	Haswell	124.85	.0723	2.00
Glucinum	2.07	R–A	129.22	.0748	2.07
Strontium	2.54	R–A	158.56	.0918	2.54
Barium	3.75	R–A	234.09	.1355	3.75
Zirconium	4.15	R–A	259.06	.1499	4.15
Selenium	4.50	Haswell	280.91	.1626	4.50
Titanium	5.30	Haswell	330.85	.1915	5.30
Vanadium	5.50	R–A	343.34	.1987	5.50
Arsenic	5.67	R–A	353.95	.2048	5.67
Columbium	6.00	Haswell	374.55	.2168	6.00
Lanthanum	6.20	Haswell	387.03	.2240	6.20
Niobium	6.27	R–A	391.40	.2265	6.27
Didymium	6.54	R–A	408.26	.2363	6.54
Cerium	6.68	R–A	417.00	.2413	6.68
Antimony	6.71	R–A	418.86	.2424	6.71
Chromium	6.80	R–A	429.49	.2457	6.80
Zinc, cast	6.867	Haswell	428.30	.2479	6.861
Zinc, pure	7.15	R–A	446.43	.2583	7.15
Zinc, rolled	7.191	Haswell	448.90	.2598	1.191

CAPACITY OF BOXES

The following table will often be found convenient, taking inside dimensions:

A box $8^2/_5$ inches by 8 inches deep, will contain a peck.
A box 8 inches square and 4⅛ inches deep, will contain a gallon.
A box 7 inches square and 2¾ inches deep, will contain a half gallon.
A box 4 inches square and 4⅕ inches deep, will contain a quart.
A box 3 inches square and 3⅔ inches deep, will contain a pint.
A box 24 inches by 17 inches and 28 inches deep, will contain a barrel.
A box 18 inches by 15½ inches and 8 inches deep, will contain a bushel.
A box 13½ inches square and 11¼ inches deep, will contain a bushel.
A box 12 inches by 11½ inches and 9 inches deep, will contain a half bushel.
A box 10 inches square and 10¾ inches deep, will contain a half bushel.

USEFUL INFORMATION

SPECIFIC GRAVITY OF CONCENTRATING ORES AND GANGUES

LEAD	Specific Gravity
Galena (lead sulphide)	7.2 to 7.7
Cerussite (lead carbonate)	6.4 to 6.5
Anglesite (lead sulphate)	6.1 to 6.4
COPPER	
Melaconite (black copper)	6.2 to 6.3
Cuprite (copper oxide)	5.8 to 6.1
Chalcocite (copper glance)	5.8 to 5.8
Bornite (peacock copper)	4.4 to 5.5
Chalcopyrite (copper pyrite)	4.1 to 4.3
Malachite (copper carbonate)	3.7 to 4.1
Chrysocalla (silicate of copper)	2.0 to 2.2
IRON	
Mispickel (iron arsenide)	5.5 to 6.0
Magnetite (iron oxide)	4.9 to 5.2
Pyrite (iron bisulphide)	4.8 to 5.2
Marcasite (iron sulphide)	4 6 to 4.8

ZINC	Specific Gravity
Smithsonite (zinc carbonate)	4.4 to 4.4
Sphalerite (zinc blende)	3.9 to 4.2
Willemite (zinc silicate)	3.9 to 4.1
GANGUE	
Barite (heavy spar)	4.3 to 4.7
Manganese Garnet	4.1 to 4.5
Iron Garnet	3.9 to 4.4
Lime Garnet	3.4 to 3.5
Fluorite (fluorspar)	3.0 to 3.2
Anhydrite (gypsum)	2.8 to 2.9
Dolomite (magnesian limestone)	2.8 to 2.9
Quartz	2.5 to 2.8
Calcite (lime carbonate)	2.5 to 2.7
Kaolinite (kaolin)	2.4 to 2.6

METALLIC CONTENTS OF PURE ORES

Magnetite (magnetic iron ore)	Iron, 72.0 per cent
Hematite (red oxide of iron)	Iron, 70.0 per cent
Iron Pyrite	Iron, 46.6 per cent
Cuprite (red oxide of copper)	Copper, 88.8 per cent
Malachite (green carbonate of copper)	Copper, 62.0 per cent
Azurite (blue carbonate of copper)	Copper, 61.0 per cent
Bornite (purple or peacock copper)	Iron, 15 per cent; Copper, 58.0 per cent
Chalcopyrite (copper pyrite)	Iron, 30 per cent; Copper, 34.0 per cent
Chalcocite (copper glance)	78.0 per cent
Galena (lead sulphide)	Lead, 86.6 per cent
Cerussite (lead carbonate)	Lead, 70.0 per cent
Zinc Blende (zinc sulphide)	Zinc, 67.0 per cent

FREEZING, FUSING, AND BOILING POINTS

Substances	Fahrenheit Degrees	Centigrade Degrees	Reaumur Degrees
Bromine freezes at	— 7.3	—18.9	—17.6
Olive oil freezes at	50	10	8
Quicksilver freezes at	—39	—39.4	—31.5
Water freezes at	32	0	0
Bismuth metal fuses at	517	269.2	211
Copper fuses at	1947	1064	963
Gold fuses at	1947	1064	1105
Iron fuses at	2800	1538	1230
Lead fuses at	621	326.9	260
Potassium fuses at	144.5	62.5	50
Silver fuses at	1760	960	800
Sodium fuses at	204	95.6	76.5
Sulphur fuses at	239	115	92
Tin fuses at	449	232	182
Zinc fuses at	786	419	329.6
Alcohol boils at	167	74.4	63
Bromine boils at	145	63	50
Ether boils at	96	35.5	28.4
Iodine boils at	347	175	140
Water boils at	212	100	80

REFERENCE TABLES

MELTING POINTS OF VARIOUS SUBSTANCES

The following figures have been taken from various authorities. Those marked (*) are given by Sir Roberts-Austen.

Substance	Deg. Cent.	Deg. Fahr.
Sulphurous Acid	—79	—112
Carbonic Acid	—70	—94
Mercury	—39.4	—39
Bromine	—7.3	18.9
Turpentine	—10	14
Hyponitric Acid	—8.9	16
Ice	0.0	32
Nitroglycerine	7.2	45
Tallow	33.3	92
Phosphorus	44.4	112
Acetic Acid	16.7	62.5
Stearine	42.8—48.9	109 —120
Spermaceti	48.9	120
Margaric Acid	55.0—60.0	131 —140
Potassium	62.5	144.5
Wax	61.1—67.8	142 —154
Stearic Acid	70.0	158
Sodium	95.6	204
Alloy { 3 Lead, 2 tin, 5 bismuth }	100	212
Iodine	113.0—115.0	236 —238.5
Sulphur	115	238.5
Alloy, 1½ tin, 1 lead	200	392
Alloy, 1 tin, 1 lead	215	419
Tin	232	449
Cadmium	321.7	561
Bismuth	269.2	517
Lead	326.9	621
Zinc	419	786
Antimony	430	806
Aluminum	657.3	1215
Magnesium	750	1382
Calcium	760	1400
Bronze	922	1672
Silver	960	1760
Potassium Sulphate	1015*	1860*
Gold	1064	1947
Copper	1064	1947
Cast Iron—white	1050 —1135*	1922 —2075*
Cast Iron—gray	1220* —1530	2228* —2786
Steel	1300 —1378	2372 —2532
Steel—hard	1410*	2570*
Steel—mild	1475*	2687*
Wrought iron	1500 —1600	2732 —2912*
Palladium	1900	3452
Platinum	1775*	3232

The melting point of metals varies in the tables given by standard authorities due to the amount of impurities contained in the samples experimented upon, and also due to the slight inaccuracy of the instruments or methods used in determining high temperatures, as well as to errors in observation.

ASSAYING

Silver.—The assay for gold and silver is not a very difficult task under ordinary conditions, but there are some ores which require considerable patience and possibly greater familiarity with chemical reactions to successfully obtain correct results.

For silver ores the method that is generally practiced is known as scorification, or the oxidizing of the metals in a clay dish, called a scorifier. The ore is weighed out (say $^1/_{10}$ of an assay ton) and placed in a scorifier and test lead (about 25 to 40 grammes, according to the character of the ore) is placed in also. The ore and about one-half of the lead are mixed in the bottom of the scorifier, and the rest of the lead poured over the mixture so as to form a cover. A pinch of borax glass is now thrown on the top and the scorifier placed in the muffle. A strong heat is maintained at first to melt the lead; this is effected by closing the muffle door and increasing the draught. As soon as the lead is fused the muffle door is opened. When the fusion is complete clear white fumes of lead arise from the scorifier. The borax glass plays an important part just here by giving liquidation to the slag so that it can be thrown to the side as fast as formed, exposing the lead for oxidation. When fusion is complete the ring of slag which is continually growing smaller closes over the lead, the heat should be raised for a minute or so and then the scorifier is removed from the muffle with suitable tongs, and the contents poured into a mould. When cold the lead button is hammered into a cube shape, and during the operation the slag is loosened from the button which is now ready for the next step, which is called cupellation, or the separation of the silver from the lead. This operation consists in oxidizing the lead of the lead button. The litharge formed by the heat being partly absorbed by the cupel, and partly driven up the chimney, leaving the gold and silver together as a bead upon the surface of the cupel. Other metals that may have remained in the lead button from the scorifier are also oxidized and so gotten rid of.

A cupel is a small, saucer-shaped vessel, made from pulverized calcined bones, or bone ash. The ash is moistened with water and moulded into the required shape, after drying thoroughly they are ready for the muffle.

When the cupel has been in the muffle a few minutes, and consequently becomes the same temperature of the muffle, the lead button is placed in the cupel by means of a suitable tongs and the muffle door closed. If the muffle has been of the proper temperature, in a minute's time or less the lead button will have quietly fused, and on opening the muffle door will appear as a little lake of molten metal on the surface of the cupel, from which arise fumes of oxide of lead. The closing of the muffle door at first is simply in order to melt the lead button by increased heat and absence of air. The muffle door is now taken down and cupellation allowed to proceed. Do not have the muffle too hot, the right degree of heat for correct cupellation can only be acquired by experience.

As the operation continues the button gradually gets smaller and smaller, by oxidation, and volatilization and absorption of the oxide, and this reduction continues until a point is reached when the last of the lead leaves the bead; finally, a film passes over the bead and then no more action is visible. The cupel is now moved to the hottest place in the muffle for a minute or so, and gradually brought out; do not remove the cupel too quickly, as it is possible the bead might "spit," that is, throw off minute particles of silver, occasioning loss.

When cool the bead is grasped by a pair of pincers, thoroughly cleaned and weighed, by using the assay-ton system of weights (which is described in another part of this book), no calculation is necessary to find ounces per ton of gold or silver contained in the ore.

As an illustration, suppose we use $^1/_{10}$ assay ton (A. T.) and the resulting bead weighs 17 milligrammes, we would know at once that the ore contained 170 ounces silver per ton, provided the ore did not contain any gold. In case

ASSAYING—Continued

the ore does contain gold, the button is placed in a test tube or parting flask, and a small quantity of dilute C. P. nitric acid poured in, heat, gently, and if the proportion of silver to the gold is more than three to one, the silver will dissolve, leaving a brown residue of metallic gold. The dissolved silver is washed several times with pure water from the gold and the residue dried and heated in a porcelain crucible, when the characteristic yellow color of the gold will be plainly seen. This is now weighed, and the weight deducted from the original silver button, the difference will represent the actual silver present in the ore.

GOLD.—Gold assays are usually conducted by the crucible method; this process is rather more complicated than the scorifier method. One advantage the crucible method has, however, is that more ore can be used for assay, and on low grade gold ores this is a necessity, as in a $^1/_{10}$ A. T. scorifier assay, the gold might be so light as to be impossible to weigh with accuracy.

The chemical changes in the crucible method are usually reducing, and that of scorification (as already stated) oxidizing.

The kind and quantity of fluxes vary considerably in the crucible method, so that it would be impossible to suggest a flux that would suit all ores. The character of the ore determines what fluxes should be used, whether acid or basic. This selection of fluxes can only be made by experience, for what might be termed an ordinary ore, a silicious one, with iron, and oxidized, little lime, and little or no sulphur, the following charges might give good results:

Ore	½ assay ton.
Bicarbonate of Soda	30 grammes.
Carbonate of Potash	15 grammes.
Litharge	25 grammes.
Argols or Flour	1 to 2 grammes.

Mix thoroughly and place in a crucible; now sprinkle considerable borax glass on the top, and the crucible is ready for the furnace. If the ore contains much sulphur, such as iron pyrites, or concentrates with little or no silica, the following charge might give satisfaction:

Ore	½ assay ton.
Bicarbonate of Soda	30 grammes.
Carbonate of Potash	15 grammes.
Litharge	25 grammes.
Silica	15 grammes.
Borax Glass	5 grammes.

Mix well and put in crucible three iron nails. If much lead is in the ore reduce the amount of litharge accordingly; a covering of borax and the charge is ready for the furnace. Have the muffle fairly hot and place crucible inside, close the muffle door and keep the heat regular. Crucible assays should be allowed to be in the furnace from thirty to forty minutes; when fusion is complete the flux will be seen perfectly still. Now remove crucible and pour contents into a mould; when cool clean the button and hammer into shape; it is then ready for cupellation. The method from this on is exactly the same as in scorification.

In some low grade ores, or ores containing no silver, it is a good plan to add a small quantity of pure silver to the lead button before cupelling; this will serve to collect the gold and have a larger button for subsequent treatment with nitric acid.

RAPID ASSAY METHODS

In the quantitative determination of elements in ores, rocks and metallurgical by-products, delicate but laborious schemes are used to obtain a careful and complete analysis. When, however, the principal constituents are required, with results reasonably accurate for practical metallurgical purposes, the tedious gravimetric processes have been replaced in smelting works by quicker

ASSAYING—Continued

volumetric schemes, which enable the chemist to turn out a large number of determinations in a day; moreover, by continued daily use of these methods the chemist has been enabled to approach, and even to equal in accuracy, the more elaborate schemes before mentioned. The following processes have given satisfaction:

SILICA. (SiO_2.)—Charge 0.5 gramme. Run to dryness with 5 cc's hydrochloric acid and 3 cc's nitric acid (replace hydrochloric acid by nitric acid according to the amount of sulphides present), take up with hydrochloric acid, add hot water, boil and filter, wash with hot water, and once with ammonia acetate, dry first in annealing cup or porcelain crucible before muffle, ignite, and weigh as silica.

BARIUM SULPHATE. ($BaSO_4$.)—When the chemist has reason to suppose that the ores contain barium sulphate, the silica, after weighing as above, is fused in a platinum crucible with about 5 grammes of a mixture of equal parts of sodium and potassium carbonates, dissolved in hot water, filtered, and washed; then dissolve the barium carbonate through the filter in dilute hydrochloric acid, add water, then sulphuric acid, boil hard, filter, ignite, and weigh as barium sulphate, which subtracted from the original weight gives silica.

IRON. (Fe.)—The filtrate from the silica is boiled, reduced while hot by the addition of a few drops of strong stannous chloride (made by dissolving metallic tin in hydrochloric acid), allowed to cool, mercuric chloride added in large excess, and titrated with a standardized solution of bichromate of potassium, (4.39 grms, to the litre of water), using a very weak solution of ferricyanide of potassium as indicator. (1 cc. bichromate solution equals 0.005 grms. iron.) Instead of reducing the iron as above, if it is desired to determine lime, the iron is precipitated by ammonia water, boiled, filtered off, dissolved through filter by dilute hydrochloric acid, reduce and continue as before, and the filtrate from the iron is treated for lime by immediately adding oxalate solution as below.

LIME. (CaO.)—Charge 0.5 grm. Dissolve in 5 cc's hydrochloric acid and 3 cc's nitric acid, neutralize with ammonia water without adding great excess, re-dissolve the iron by adding a very hot solution of oxalic acid, boil hard, settle, decant twice on filter and wash until washings fail to discolor a drop of permanganate of potassium in dilute sulphuric acid. Wash precipitate through filter into a beaker containing hot sulphuric acid, boil, titrate hot with a solution of permanganate of potassium (5.7 grms. to the litre of water). Iron standard of permanganate of potassium multiplied by 0.5 gives the standard for lime, or in other words 1 cc. permanganate equals 0.005 grms. lime.

MAGNESIA. (MgO.)—The filtrate from the lime is treated with large excess of ammonia and a solution of sodium phosphate added, about 5 grammes dissolved in water; the mixture is allowed to stand twelve hours in a cool place, filtered, washed with dilute ammonia and cold water, ignite in assay muffle and weigh as magnesium pyrophosphate, from which magnesia is obtained by multiplying the result by 0.36036.

ZINC. (Zn.)—Charge one gramme in covered casserole, add 20 grms. ammonia nitrate salt and 5 cc's nitric acid, run to dryness, cool, and add 20 cc's hot water and 15 cc's ammonia, boil four minutes, filter, and if filtrate has a brownish tinge (due to manganese) add 10 cc's more ammonia, boil with cover off and refilter, make acid with hydrochloric acid and add 7 cc's excess, also 30 grms. granulated lead, or less according to the amount of copper present as indicated by blue color; let stand until the solution clears, or place filtrate and lead in a small flask, and shake to precipitate the copper. Let cool, titrate with solution of ferro-cyanide of potassium (45 grms. to the litre of water), using acetate or nitrate of uranium as indicator. 1 cc. of solution used equals 0.01 grm. of zinc.

MANGANESE. (Mn.)—Charge 0.5 gramme. Dissolve in 5 cc's hydrochloric acid, add 5 cc's nitric acid, neutralize with emulsion of zinc oxide, filter

ASSAYING—Continued

into a large flask, dilute with water to about 400 cc's, boil hard and titrate quickly with permanganate of potassium, shaking the flask vigorously after each addition. The iron standard multiplied by 0.294 gives the standard for manganese.

ALUMINA. (Al_2O_3.)—In fire clays, etc., not soluble in acids. Fuse 0.5 grm. in a platinum crucible with 5 to 7 grms. of mixed alkaline carbonates, dissolve in hydroghloric acid, run to dryness, take up with hydrochloric and nitric acids and filter off the silica (this scheme applies to any substance insoluble in acids in which silica is desired. The chemist should be careful in testing lead ores to dissolve out the lead with nitric acid before fusing in a platinum dish). The filtrate is neutralized and boiled with caustic potash. The iron is filtered off and determined if desired. Add hydrochloric acid very slight excess to the filtrate, and add ammonia, boil, filter ignite precipitate, and weigh as Al_2O_3.

LEAD.—Weigh ½ to 1 grm. in covered casserole, add 10 cc. nitric acid, warm until red fumes are off, add 10 cc. sulphuric acid and boil to white fumes, cool, add 30 cc. water, boil and filter into 500 cc. flask, washing with cold water.

Wash residue back into casserole, add 5 grm. C. P. ammonium chloride and 1 cc. C. P. HCl, boil until dissolved, add 5-10 cc. ammonium sulphide, boil and filter through the original filter. Rinse lead sulphide back into casserole, add 7 cc. (1-10) sulphuric acid, shake to break up clots, add 25 cc. strong hydrogen sulphide water and filter.

Put filter with contents into casserole, add 5-10 cc. HCl, boil out hydrogen sulphide, add few drops nitric acid, then 25 cc. cold water, then slight excess ammonia, and then make distinctly acid with acetic acid. Boil, dilute to 200 cc. with hot water and titrate with ammonium molybdate solution, using tannic acid (.1 grm. in 20 cc. water) as indicator until a yellow tinge shows on spot plate.

The ammonium molybdate is made by dissolving 8.5 grms. in one litre water; 1 cc. equivalent to about .01 grm. lead.

To standardize, weigh .4 grm. C. P. lead foil, add 3 cc. nitric acid and 6 cc. water and, after solution, boil just to dryness. Dissolve in 30 cc. water, add 5 cc. sulphuric acid, agitate, settle a short time and filter. Put ppt. and paper into beaker and boil with 10 c.c. HCl until paper disintegrated, add 15 cc. HCl, 25 cc. cold water and then 25 cc. or so ammonia to alkalinity. Distinctly acidify with acetic acid, dilute to 200 cc. with hot water, boil and titrate.

COPPER. (Cu.)—To the filtrate in 500 cc. flask from lead precipitate (see previous paragraph), is added 5 grammes of powdered or granulated metallic zinc, or sheet aluminum, and the whole allowed to stand until the copper is precipitated from the solution, as indicated by testing a couple of drops of the clear liquid with sulphuretted hydrogen. Ten cc's sulphuric acid are added to dissolve the excess of zinc used, the flask is then thrice filled with hot water and decanted. (These combined decantations can be immediately titrated for iron with permnaganate of potassium.) The moss copper is dissolved in 3 cc's nitric acid, red fumes boiled off, 10 cc's ammonia water added and titrated with a solution of potassium cyanide, 25 grms. to the litre of water, (1 cc. equals about 0.005 grammes copper), until the color is nearly bleached, dilute 100 cc's and titration completed. Dissolve about 0.200 grm. of pure copper in about 3 cc's nitric acid, and add 10 cc's of ammonia water, titrate with the cyanide solution, and note the number of cc's required to decolorize. Make calculations accordingly. As cyanide of potash solutions do not remain of constant strength the solution should occasionally be standardized by pure copper as before stated. Some metals interfere in a measure with this method, but is exact enough for practical purposes.

SUB-IODIDE METHOD FOR COPPER.—Digest. 5 to 1 grammes of ore with 5 cc's nitric acid, 5 cc's hydrochloric acid, 10 cc's sulphuric acid, boil until white fumes, add 40 cc's water, boil, and filter through a 9 cm. filter to get rid of lead sulphate, bismuth sulphate, etc., wash with water acidulated with sul-

ASSAYING—Continued

phuric acid, do not get over 75 cc's of solution in a No. 2 beaker. Put in solution a piece of aluminum foil or sheet and boil, when effervescence commences boil for about five minutes afterward, decant on a 9 cm. filter and wash, add a little nitric acid to the filter to dissolve any copper that may have been retained, and add to the copper in the beaker, dissolve with nitric acid, care being taken not to have too much solution, transfer into an 8 oz. pear-shaped flask, add ½ grm. potassium chlorate, and boil down to about 2 cc's or until it gets thick; care must be taken to boil to dryness, take up with 5 cc's water, then add 5 cc's ammonia, boil about a minute, add 6 cc's acetic acid, and 40 cc's water and titrate. Standard solution of hyposulphite of soda: 19 grammes of hyposulphite of 1 litre. One cc. equals about 0.005 grm. copper.

Put in a flask 3 grammes potash iodide, and add at once hyposulphite of soda solution until solution turns yellowish, then add starch solution and titrate, the end reaction being very distinct. Weigh out pure copper and treat same as above and estimate strength of hyposulphite of soda solution (as in the case of cyanide of potash method).

COPPER (BY BATTERY.)—Weigh out from ½ to 1 gramme of ore in a No. 2 beaker, just moisten with a drop or two of water, then add from 10 to 15 cc's of strong nitric acid, and 5 to 8 cc's of sulphuric acid; heat until white fumes of sulphuric acid are given off. Be sure that all of the ore (which is soluble in acids) has been dissolved, then dilute to about 30 cc's, heat again, just to boiling, to disintegrate the mass, filter off residue in which the lead and silica may be determined if desired. Filter solution into a No. 2 beaker, add one or two strips of heavy aluminum foil, and boil for 10 or 15 minutes, which is generally sufficient to insure complete precipitation of the copper. Pour off the solution and wash three times by decantation with hot water. Then add 3 or 4 cc's of strong nitric acid to the contents of the beaker, allowing the acid to flow over the aluminum. Boil to expel the nitrous fumes, decant into another beaker (which should be narrow) and rinse the aluminum with a few cc's of water, just neutralize the solution with ammonia, and add about 15 cc's of 1 to 10 sulphuric acid. Place platinum cylinder into the solution connecting it with the negative or zinc element of the battery; inside of the cylinder place a platinum wire spiral reaching almost to the bottom of the beaker, being careful not to allow the spiral to touch the cylinder.

A very good battery for this purpose is a Bunsen cell; about eight hours is usually required for a total precipitation of copper. To determine if all the copper has been precipitated, dilute solution in beaker so as to raise it over the precipitated copper on the cylinder, and if all the copper has been precipitated there will be no further deposition of copper on the cylinder after an hour. Another test is by removing a drop or two of the solution and testing it with hydrogen sulphide. If test shows that all copper has been removed, then without turning off the current, remove the cylinder and place immediately into a beaker of warm water so as to wash off as quickly as possible all acid from the cylinder. It is always advisable to have two beakers of water so as to give the cylinder two washings, thus insuring a quick and absolute removal of all acids and salts. After cylinder has been thoroughly washed, place into a beaker of alcohol which removes the water; then dry as quickly and carefully as possible, avoiding the oxidation of the copper on the cylinder. The precipitated copper should be a bright rose-red color.

In case the ore contains only a trace of arsenic, antimony or bismuth, the precipitation of the copper on the aluminum, oil may be dispensed with. In that case after the ore has been dissolved and the mass disintegrated, add enough ammonia to just neutralize this solution; and add ½ gramme ammonia nitrate and 15 cc's of 1 to 10 sulphuric acid, place on battery same as before.

TIN. (IN ALLOYS.)—The alloy is oxidized with moderately strong nitric acid, the mass mixed with an excess of ammonia and sulphide of ammonia, and digested for some time in a closed flask. In this way the tin is entirely dis-

ASSAYING—Continued

solved as a sulphide. The solution is filtered off from the other sulphides, which are then washed with very weak sulphide of ammonia, and dried. From the solution the bisulphide of tin is precipitated by dilute hydrochloric acid, filtered off, washed and dried. It is then gradually heated together with the filter, in a porcelain crucible, with free access of air, at first gently, then ultimately to redness, then cool and moisten with nitric acid and heat to redness, so that it may be entirely converted into binoxide of tin, and weigh as such. A fragment of ammonium carbonate is held in the crucible at the end of the operation to remove any sulphuric acid that may have been formed.

TIN. (In ORES.)—Dissolve ore in aqua regia, filter off solution containing lead and copper. Dry residue and place in a porcelain crucible and ignite; after all carbon has been burned off, add 3 parts of sodium carbonate and 3 parts of sulphur, then fuse, dissolve this mass in water and filter off silica, acidify filtrate with hydrochloric acid, and pass in hydrogen sulphate; this precipitates the tin sulphide. Filter this sulphide and treat same as above, (in alloys).

BLAST-FURNACE SLAGS

To obtain a sample slag which shall be soluble in acids, an iron rod is dipped into a pot of molten slag and the adhering slag quickly cooled in a jet of water. A small portion, 3 grammes, is pulverized exceedingly fine in an agate mortar and the elements determined as follows:

SILICA AND LIME.—Half gramme charge in porcelain evaporating dish and 2 cc's hot water, stir, add 3 cc's hydrochloric acid and run to complete dryness, stirring meanwhile to prevent spitting, cool, take up with 3 cc's hydrochloric acid, stir, and add hot water, boil and filter, weigh up residue as silica, and determine lime in filtrate as described in method for lime assay after adding about 4 cc's nitric acid to oxidize the iron.

IRON.—Dissolve half a gramme charge in a beaker by adding 25 cc's hot water, stirring, and then adding 10 cc's hydrochloric acid, boil, reduce with stannous chloride, add excess mercuric chloride, and titrate with potassium bi-chromate, as in the method of iron assay.

MANGANESE.—Treat half a gramme charge in a porcelain evaporating dish, using inverted funnel for cover, with 5 cc's nitric acid, 2 cc's sulphuric acid, and 1 cc. hydrochloric acid, heat just to pasty condition, take up with water and 2 cc's nitric acid, neutralize with zinc oxide, and proceed as in the method for manganese assay.

Slags have been repeatedly analyzed for silica, iron, lime and manganese by the above methods, in forty minutes.

ARSENIC AND ANTIMONY

(L. B. Skinner and R. H. Hawley)

SOLUTIONS.—Copper, Zinc Chloride. To one pound C. P. stick zinc add 500 cc. water and then gradually add 1200 cc. C. P. hydrochloric acid. Boil this solution until the boiling point reaches 108° C.

Dissolve 300 grms C.P. cupric chloride in one litre C.P. hydrochloric acid and mix this solution with the zinc chloride made as above.

Standard Iodine. Dissolve 75 grms potassium iodide in the smallest amount of water possible and to this add 34 grms of iodine. After the iodine is all dissolved make up to two litres, which should give a solution such that one cc. is equivalent to .005 grms arsenic. Weaker standard solutions may be used for more delicacy.

To Standardize. Take 300 milligrams C.P. arsenious acid (As_2O_3), dissolve in about 2 grams caustic soda in water, dilute to 200 cc., acidify faintly with

ASSAYING—Continued

hydrochloric acid, cool thoroughly, add 2 grams sodium bicarbonate and then some starch solution, titrating to a permanent blue color.

300 milligrams arsenious acid multiplied by .7576 gives .2273 grams arsenic. This weight divided by the number of cc. used gives the value per cc.

Run a blank on the zinc copper chloride solution by dissolving 300 mgrm. arsenious acid in caustic soda acidifying with HCl, precipitating with hydrogen sulphide and distilling as outlined in the scheme following. This on the same amount of arsenic may show a higher burette reading owing to impurity in the copper chloride used. Deduct the number of cc. over the standard from all regular determinations.

ORES.—For heavy sulphide ores low in arsenic weigh in 25 grm. of finely ground pulp, digest with 100 cc. C.P. nitric acid in a 6-inch porcelain dish (the acid being added slowly), boil out red fumes, add 75 cc. C.P. sulphuric acid and boil to copious white fumes. Cool the dish, add about 150 cc. water, 50 cc. HCl (10 grm. trataric acid, if Sb is to be determined), and carefully boil to dissolve all salts.

Filter into a No. 6 beaker, nearly neutralize the filtrate with ammonia, heat to about 70° C. and add slowly, with stirring, a mixture of 15 cc. ammonia bisulphite and 30 cc. ammonia until almost all the red color has disappeared, showing a thorough reduction. Add a little HCl to decompose all the sulphite and boil until there is no odor of sulphurous acid.

While hot, pass sulphuretted hydrogen in a lively manner for about 30 minutes or until precipitation is complete; filter through 11 cm. paper and test filtrate with hydrogen sulphide. The washed ppt., with paper, is put into distilling flask and 50 cc. of the copper zinc chloride solution is poured in through a funnel reaching below the side opening. If the ppt. is too bulky to get in with ease, it may be dried some.

The distilling apparatus is a 6 or 8 oz. flask with the side arm bent down to fit into a Liebig condenser set vertically. Heat is supplied by a small flame such as that from an alcohol burner. The lower end of the condenser just dips into about 40 cc. of water in a No. 1 beaker. A thermometer is inserted through a rubber stopper fitting the neck of the flask so that the bottom end is ¼ inch from the bottom of the flask.

After charging the distilling flask, heat is applied and the distillation proceeded with until the thermometer registers 115° C. This should take about 15 minutes and the arsenic should be all over; to make sure, the stopper may be removed, 10 cc. HCl added and a second distillation made. Some elementary sulphur distills over, but this does no harm.

Pour distillate into No. 3 beaker, add excess ammonia, just acidify with HCl, cool thoroughly, add sodium bicarbonate and starch solution and titrate with standard iodine solution to first permanent blue color, deduct the excess found in the blank and calculate the arsenic.

ANTIMONY.—Add about 50 cc. saturated zinc chloride solution to the residue in the flask, replace the thermometer by a glass tube reaching nearly to the level of the liquid and through this tube pass hydrochloric acid gas generated by sulphuric acid, dropping from a separatory funnel into liquid HCl at the rate of about two drops a second.

The condenser is sealed as before with cold water and heat is applied to the flask until the mass is about dry, removing the beaker from the condenser every few minutes to see if the antimony has ceased coming over. To these beakers is added a little tartaric acid to keep the antimony in solution, ammonia is added to nearly neutralization and hydrogen sulphide passed through to precipitate the orange red sulphide. When the beaker last removed shows

ASSAYING—Concluded

only a small amount of precipitate, stop heating the flask, combine the distillates, thoroughly ppt. with H_2S, filter on a tared gooch crucible, heat about one hour at 255° C. to constant weight and multiply by .714.

Do not heat too strongly or copper will come over, which may be told by the darkening of the orange red pot.

This scheme may be most satisfactorily used for 1 grm. charges on high arsenic ores by using the usual amounts of acid for casserole work, not filtering off gangue where the amount is low and not neutralizing the filtrate before the reduction with bisulphite.

SULPHUR. (S.)—Charge one gramme in iron dish with about 10 grammes of a mixture of 5 parts of carbonate of soda and 3 of nitrate of potassium, heat slowly in a muffle until the mass swells up; cool, dissolve in hot water, filter, make acid with hydrochloric acid, add solution of barium chloride, boil hard, settle, decant, filter, ignite, and weigh as barium sulphate, multiply the result by 0.1374 to obtain sulphur. Or the ore may be treated with nitric acid, boil nearly to a dryness, take up with hydrochloric acid, boil until the nitric acid is entirely evaporated, dilute with water, filter, add water to about 300 cc's. warm, and add excess barium chloride, filter, wash precipitate well, ignite, and weigh as above.

ATOMIC WEIGHTS

The Atomic Weights given in the following tables were published by The Journal of the American Chemical Society, Vol. XXI., No. 2, February, 1900. These Atomic Weights were used in figuring the factors for calculating gravimetric analysis.

NAME	Sym.	Atomic Weight	Melting Point°C	Properties	QUALITATIVE TESTS
Aluminum...	Al	27.1	700	Tin white metal.	NH_4OH ppts. white $Al_2(OH)_6$, only slightly sol. in excess NH_4OH, but sol. in excess fixed alkalies.
Antimony...	Sb	120.0	432	Bluish white, brittle metal.	Marsh test—SbH_3 burns giving velvety brown lustre on cold porcelain, a drop of HNO_3 turns it white—H_2S gives orange red ppt.
Argon.....		39.9?	...	Colorless, odorless gas.	
Arsenic.....	As	75.0	...	Volatilizes at 450°. Crystalline solid.	Marsh test—AsH_3 burns giving steel gray lustre on cold porcelain, a drop of HNO_3 dissolves it—H_2S gives a yellow ppt.
Barium.....	Ba	137.43	475	Yellow white metal.	A drop of H_2SO_4 gives immediate ppt. of $BaSO_4$. Distinguished from $SrSO_4$ and $CaSO_4$ by the ppt. being immediate.
Beryllium...	Be	9.08	?	Steel colored, hard crystals.	Distinguished from Al and Zn by solubility of its hydroxide and carbonate in excess of $(NH_4)_2CO_3$.
Bismuth.....	Bi	208.0	268	Reddish white metal.	½ cc. conc. sol. of $BiCl_3$ poured into 600 cc. H_2O gives white cloud of BiOCl (basic salt).
Boron.....	B	10.95	Very high	Red brown powder, infusible in white heat.	Moisten a borate with conc. H_2SO_4 heat, then moisten this salt with glycerine, this on Pt. wire gives green color in non-luminous flame.
Bromine.....	Br	79.95	—7.2	Suffocating odor. Brown red liquid.	CS_2 dissolves Br in water solution and turns brown. It bleaches litmus. $AgNO_3$ gives a yellow white ppt. of AgBr.
Cadmium....	Cd	112.3	320	White crystalline metal. Malleable and ductile.	H_2S ppts. yellow CdS insol. in alkali sulphides, soluble in dilute hot H_2SO_4.
Caesium.....	Cs	132.9	26	Silver white ductile metal.	$SbCl_3$ ppts. $CsSbCl_4$ completely separating it from other alkalies. $SnCl_4$ ppts. Cs_2SnCl_6 insoluble in strong HCl but soluble in H_2O.
Calcium.. ..	Ca	40.1	Red heat	Pale yellow metal.	$CaSO_4$ ppts. slowly, distinguished from $SrSO_4$ by being soluble in conc. $(NH_4)_2SO_4$. Alkaline carbonate immediately ppts. calcium carbonate
Carbon.....	C	12.00	?	Practically infusible. Diamond and graphite.	Tested by the formation of CO_2 either by the ignition of the substance or by the decomposition of carbonates with a mineral acid.
Cerium.....	Ce	140.0	850	Steel gray color. Burns in Cl gas.	Sodium hypochlorite added to a cerrous salt gives reddish cerric hydrate soluble in warm HCl.
Chlorine.....	Cl	35.45	...	Greenish yellow gas. Suffocating odor.	Bleaches litmus. $AgNO_3$ gives ppt. AgCl. If a solution of KI and starch is added to Cl solution a blue color will appear.
Chromium...	Cr	52.14	Over 1775	Light green powder.	Ag salt ppt. dark red Ag_2CrO_4. Ignition on charcoal gives green mass. Fused in borax bead in Red. or Oxid. flame gives emerald green bead when cold.
Cobalt.....	Co	59.0	1500	Harder than iron. Malleable and ductile.	Add NH_4OH and NH_4Cl with ferricyanide gives a blood red color as evidence of cobalt. Salts heated in borax bead give blue color.
Columbium..	Cb	93.5	2950		

ATOMIC WEIGHTS—Continued

NAME	Sym.	Atomic Weight	Melting Point°C.	Properties	QUALITATIVE TESTS
Copper.....	Cu	63.6	1054	Red metal. Malleable and ductile.	NH_4OH in excess gives a deep blue color. Fused with borax bead in Oxid. flame gives green bead when hot and blue bead when cold.
Decippium...	Dp	171.0?	?	Metal has not been isolated.	The double sulphate of decippium and potassium insol. in saturated solution of K_2SO_4. Further research required before existence of Dp. can be established.
Didymium...	Di	142.12	?	White ductile metal.	Not yet definitely established as an element.
Dyprosium..	Dy	162.5			
Erbium.....	Er	166.0	?	Metal not isolated.	The spectrum of Er_2O_3 gives characteristic lines.
Europium...	Eu	152			
Fluorine.....	F	19.05		Colorless gas.	The corrosive action of hydrofluoric acid on glass.
Gadolinium..	Gd	157.3			
Gallium.....	Ga	70.0	30	Gray, soft metal.	Passing induction spark over solution and this light through spectroscope gives characteristic lines and colors.
Germanium.	Gr	72.5	900	White brittle metal.	Saturate alkaline solution with NH_4HS, add excess mineral acid gives white GrS_2.
Glucinum....	Ge	72.5	900		
Gold.....	Au	197.3	1045	Soft, yellow metal. Malleable and ductile.	Neither HNO_3 nor HCl attack it. Aqua Regia dissolves it readily.
Helium.....	He	4.0	271.3		
Hydrogen...	H	1.00		Colorless gas.	Burns with non-luminous flame. This on cold porcelain surface gives H_2O.
Indium	In	114.8	155		
Iodine.....	I	126.91	114		
Iridium.....	Ir	193.0	?	White lustrous mass, harder than iron.	A yellow curdy ppt. obtained by dissolving $IrCl_2$ in excess of $(NH_4)_2CO_3$ and neutralizing the greenish yellow liquid with HCl. Insol. in hot and cold water.
Iron.....	Fe	56.0	1550	Gray metal, three varieties, cast, wrought iron and steel.	$K_6Fe_2(CN)_{12}$ Potassium ferricyanide, gives a dark blue color with Ferrous iron. KS(CN) (Potassium sulphocyanide) gives red color with ferric iron.
Indium.....	In	114.0	?	White non-crystalline metal.	Salts moistened with HCl color a non-luminous flame dark blue.
Iodine.....	I	126.85	114	Dark iron gray solid.	CS_2 dissolves I from water solution and turns violet. Free Iodine colors boiled starch solution blue to violet.
Krypton....	Kr	83.0	810		
Lanthanum..	La	138.5	?	Iron gray metal. Malleable and ductile.	Salts possess an astringent sweetish taste. Salts do not color beads of borax or microcosmic salt.
Lead.....	Pb	206.92	326	Bluish white metal.	K_2CrO_4 ppts. $PbCrO_4$ yellow. Soluble in fixed alkalies, insoluble in chromic acid.

ATOMIC WEIGHTS—Continued

NAME	Sym.	Atomic Weight	Melting Point °C	Properties	QUALITATIVE TESTS
Lithium.....	Li	7.03	180	Gray metal.	Examination by spectroscope will detect minute traces. Salt gives red color in non-luminous flame.
Magnesium..	Mg	24.36	500	White malleable metal.	Fixed alkali hydrates ppt. $Mg(OH)_2$ which is soluble in NH_4Cl.
Manganese..	Mn	55.02	1800	Gray brittle metal.	Ignition with alkali and Oxid. agent on platinum foil gives a bright green mass.
Mercury.....	Hg	200.0	-38.8	Silvery white liquid metal.	HCl ppts. white HgCl, which on adding ammonia hydrate is turned black.
Molybdenum	Mo	96.0	Over 1775	White brittle metal.	Dry molybdates heated on platinum foil with conc. sulphuric acid to vaporization of latter forms on cooling a blue mass.
Neodyminum	No	144.27	840		
Neon.....	Ne	20	...		
Nickel.....	Ni	58.70	1450	White, hard, ductile metal.	Ferricyanides ppt. greenish yellow nickel ferricyanide. Salts give violet borax bead while hot and brown when cold in oxidizing flame.
Niobium....	Nb	93.81	?	Steel gray, lustrous metal.	Hydrochloric acid solution with metallic zinc gives a characteristic blue color, then a brown, due to the lower oxide being formed.
Nitrogen....	N	14.04	...	Colorless odorless gas.	Gas does not support combustion.
Norwegium..	Ng	218.92	254	Reddish white metal.	This element precipitates an oxychloride the same as Bi, but unlike Bi this is soluble in alkaline hydrates and carbonates.
Osmium.....	Os	190.8	?	Lustrous blue white metal.	Fuse salt with KOH and KNO_3, dissolve in water, add NH_4Cl, wash yellow ppt. with very dilute HCl, dissolve in warm water, add K_4Fe Cn_6 gives violet color.
Oxygen.....	O	16.00	...	Colorless odorless gas.	Smoldering ember begins to blaze when put into the gas.
Palladium...	Pd	106.5	1360	White malleable ductile metal.	NH_4OH ppts. flesh red $NH_2H_6PdCl_2$ soluble in excess; from this solution it may be reprecipitated by HCl with a yellow color.
Phosphorus..	P	31.0	45	Transparent solid, also red phosphorus.	The nitric acid solution of ammonium molybdate gives a yellow ppt. with phosphoric acid and its salts.
Platinum....	Pt	195.2	1775	White metal, malleable and ductile.	Insol. in hot or cold HNO_3 or HCl, but soluble in aqua regia. Add KCl to $PtCl_4$ in neutral solution, not too dilute, add alcohol, gives yellow ppt.
Potassium...	K	39.14	63	White soft metal. Decomposes water.	Identified chiefly by its color flame in spectroscope (purple flame). Test for KCl as above tested for $PtCl_4$ in alcohol solutions.
Praseodymium.....	Pr	140.6	940		
Radium.....	Rd	226.4	...		
Rhodium....	Rh	103.0	2000	Very hard white metal.	Mix mineral intimately with NaCl, put into a porcelain boat and heat in atmosphere of Cl_2, cool, and dissolve in water, gives a rose red powder.

ATOMIC WEIGHTS—Continued

NAME	Sym.	Atomic Weight	Melting Point °C	Properties	QUALITATIVE TESTS
Rubidium...	Rb	85.44	38	Wax-like lustrous metal.	Salts in non-luminous flame give slightly redder tint than potassium. Characteristic lines in spectroscope.
Ruthenium..	Ru	101.7	Over 2000	White lustrous heavy, brittle metal.	Fuse substance on Pt foil with excess of KNO_3, when cold dissolve in water, giving a strongly colored orange yellow solution.
Samarium...	Sm	150.0?	?	Metal has not been isolated.	Some authorities claim samarium to be made up of four bodies.
Scandium....	Sc	44.0	?	Metal has not been isolated.	Gives characteristic lines in spectrum.
Selenium....	Se	79.2	217	Amorphous and crystalline solid.	Pass SO_2 into cold solution of selenious acid a brick red ppt. of selenium is formed. Pass SO_2 into hot solution of selenious acid a black ppt. forms.
Silicon.....	Si	28.4	Very high.	Amorphous, graphoidal and adamantine.	If a salt is fused in microcosmic bead particles of SiO_2 float around undecomposed.
Silver.....	Ag	107.93	954	Whitest of all metals.	Silver salts pptd. by Cl, Br, and I. arsenites ppt. yellow, Ag_3AsO_3 from a neutral solution of a silver salt, soluble in dilute acids.
Sodium.....	Na	23.05	96	Whitish soft metal. Decomposes water.	Identified chiefly by its color flame in spectroscope (yellow flame). $PtCl_4$ ppts. red prisms of $(NaCl)_2$ $PtCl_4$ from Na solutions slightly acidified.
Strontium...	Sr	87.68	?	White metal. Melts at red heat.	After separating from $BaSO_4$, $SrSO_4$ will be precipitated by H_2SO_4, distinguished from $CaSO_4$ by being insoluble in conc. $(NH_4)_2$ SO_4.
Sulphur.....	S	32.06	114	Yellow brittle, solid.	Distinctive odor of SO_2. Sulphuric acid gives immediate ppt. of $BaSO_4$ by the addition of $BaCl_2$.
Tantalum...	Ta	183.0	?	Metal has not been isolated.	An amethyst color is obtained by adding a very small quantity of Ta_2O_5 to a solution of resorcin in sulphuric acid.
Tellurium...	Te	127.5?	455	Amorphous and crystalline solid.	H_2TeO_4 solution saturated with H_2S kept warm in closed flask for some time the liquid becomes brown, TeS_2 being formed.
Terbium.....	Tr	160.0	?	Metal has not been isolated.	Tr_2O_3 dark orange yellow powder becomes colorless when heated in hydrogen.
Thallium....	Tl	204.15	294	Bluish white metal.	Distinguished by its intense green color in a non-luminous flame. Small traces can be detected by the use of the spectroscope.
Thorium....	Th	233.0	?	Grayish white glistening powder.	Saturation of solution of Th salt with K_2SO_4 forms white ppt. insol. in K_2SO_4 solution, but soluble in water.
Thulium.....	Tm	168.5	...		
Tin.....	Sn	119.0	233	Lustrous white metal.	H_2S ppts. brown SnS in dilute acid solution. Thiosulphates do not give a ppt., distinction from As and Sb.
Titanium....	Ti	48.17	?	Black lustrous powder.	Titanium salts with microcosmic salt when heated in reducing flame gives a violet bead when cold.

ATOMIC WEIGHTS—Concluded

NAME	Sym	Atomic Weight	Melting Point °C	Properties	QUALITATIVE TESTS
Tungsten....	Wo	184.4	?	Steel gray hard crystalline powder.	The addition of H_2S to an acidulated solution of a tungstate gives no ppt., but gives a blue color.
Uranium....	U	240.0	?	Melts at bright red heat. Grayish white metal.	$(NH_4)_2$ S gives dark brown ppt. K_4Fe $(CN)_6$ gives a reddish brown ppt., soluble in $(NH_4)_2$ CO_3.
Vanadium...	V	51.4	Over 1800	Light gray lustrous powder.	Vanadium salts give colorless bead with borax or microcosmic salt in outer flame, and becoming light green in inner or reducing flame.
Xenon.....	Xe	130.7	−140		
Ytterbium...	Yb	173.0	?	Metal has not been isolated.	Characteristic lines shown by spectrum.
Yttrium.....	Y	89.0	?	Dark gray powder.	Most readily recognized by spark spectrum.
Zinc.....	Zn	65.4	419	Bluish white metal.	NH_4OH gives a white ppt. of Zn $(OH)_2$, soluble in excess of NH_4OH.
Zirconium...	Zr	90.5	Over 1300	Black powder, also grayish crystalline solid.	Addition of hot concentrated solution of K_2SO_4 to Zr salts sol. ppts. white basic sulphate of Zr. insol. in water, nearly insol. in HCl.

FACTORS FOR CALCULATING GRAVEMETRIC ANALYSIS

Substance Weighed	Sought	Factor
Ammonium. Ammonium Platinum Chloride $(NH_4)_2$ $PtCl_6$	NH_3	0.0767
Arsenic.		
Arsenic Trisulphide As_2 S_3	As	0.6097
Magnesium Pyro-Arsenate Mg_2 As_2 O_7	As	0.4828
Barium. Barium Sulphate $BaSO_4$	BaO	0.6573
Calcium. Calcium Carbonate $CaCO_3$	CaO	0.5604
Chlorine. Silver Chloride Ag Cl	Cl	0.2472
	HCl	0.2542
	NaCl	0.4080
Copper. Copper Oxide CuO	Cu	0.7989
Iron. Ferric Oxide Fe_2 O_3	Fe	0.7000
	Pb	0.6831
Lead. Lead Sulphate $PbSO_4$	FeO	0.9000
Magnesia. Magnesium Pyro-Phosphate Mg_2 P_2 O_7	MgO	0.3624
Manganese. Manganese Sulphide MnS	Mn	0.6323
	MnO	0.8161
Mercury.		
Mercurous Chloride Hg_2 Cl_2	Hg	0.8494
Mercuric Sulphide HgS	Hg	0.8621
Phosphorus. Magnesium Pyro-Phosphate Mg_2 P_2 O_7	P_2O_5	0.6375
	P	0.2783
Potassium.		
Potassium Sulphate K_2 So_4	K_2O	0.5409
	K_2O	0.1939
Potassium Platinum Chloride K_2 Pt Cl_6	KCl	0.3068
Sodium. Sodium Sulphate Na_2 SO_4	Na_2O	0.4370
Tin. Stannic Oxide SnO_2	Sn	0.7881
Sulphur. Barium Sulphate $BaSO_4$	S	0.1371
	SO_3	0.3427
	H_2SO_4	0.4198
Zinc. Zinc Sulphide ZnS	Zn	0.6714
	ZnO	0.8357

CYANIDE

HOW TO DETERMINE PURITY OF POTASSIUM OR SODIUM CYANIDE

Take a sample of the KCN to be tested across the thickness of the cake. Reduce this sample by crushing to a fine powder. To one gram of this reduced sample add 100 c.c. of distilled water. Take 10 c.c. of this solution and titrate it with standard Silver Nitrate. The number of c.c. of Silver Nitrate required to produce a permanent precipitate multiplied by five will give the percentage of KCN contained in sample.

The above is not a determination of actual Cyanogen present, but a simple test to give working value of Cyanide.

STRENGTH OF CYANIDE SOLUTION

To 1000 c.c. of distilled water add 6.535 grains of c.p. Silver Nitrate and standardize with a known strength of Cyanide solution.

For determining the amount of Cyanide in solution, take 10 c.c. of the solution (measured in a pipette) and place it in a small beaker; titrate this with the Silver Nitrate solution, until an opalescent precipitate appears. The number of c.c. of Silver Nitrate used in tritration will then equal the number of pounds of Cyanide in one ton of the solution.

TESTING CYANIDE

The standard test in use is the so-called Nitrate of Silver test. This test is based on the fact that Cyanides form with Nitrate of Silver, when both are in solution, precipitates. In practice, a given quantity of Cyanide to be tested is dissolved in distilled water and titrated with one-tenth normal solution of Nitrate of Silver. As the curdy white precipitate, Cyanide of Silver, readily dissolves, as long as there is a surplus of Cyanide in the solution present, sufficient Nitrate of Silver solution is added until a permanent milky appearance is obtained. The addition of a small quantity of Chloride of Sodium or Iodide of Potassium will help to give a more distinct reaction to the eye. Each cubic centimeter normal solution of Nitrate of Silver is equal to 0.013 grams pure Cyanide, so the exact strength of the Cyanide is easily ascertained. It is obvious that the strength of the Nitrate of Silver solution may be so adjusted as to save all further calculation. This formula is also useful for estimating the strength of Cyanide solution.

ACIDITY TEST

Place fifty grams of pulp in a bottle suitable for agitating; add 25 c.c. of a deci-normal (N/10) caustic soda solution (as described further on) and 75 c.c. of water; agitate for an hour and filter off the solution. Titrate 20 c.c. of this filtrate with a deci-normal (N/10) solution of Sulphuric Acid, using as an indicator Phenolphthalien or Methyl-Orange.

Five minus the Burette reading, multiplied by 2, will give the number of pounds of lime necessary to add to each ton of ore to keep the Cyanide solution at the proper point of alkalinity.

In connection with the above, lime is presumed to be 65° pure.

It is advisable before making above acid test to agitate fifty grains of ore with 100 c.c. of water, filter and try the filtrate with litmus paper. If this shows a strong reaction, there is a quantity of free acid present, which may be removed by a water wash.

PREPARATION OF N/10 SULPHURIC ACID SOLUTION

Add 30 c.c. concentrated c.p. Sulphuric Acid to a litre of distilled water; make determination of Sulphuric Acid and correct until solution is absolutely normal; each c.c. of this solution then contains .049 grains of H_2SO_4; add 100 c.c. of this solution to 900 c.c. of distilled water, and we have the N/10 solution, each c.c. of which contains .0049 Sulphuric Acid.

CYANIDE—Continued

PREPARATION OF N/10 SODIUM HYDRATE SOLUTION

Dissolve about 56 grains of pure Caustic Soda in 1000 cc. of distilled water (this will give a solution slightly stronger than normal). Titrate this with the normal Sulphuric Acid solution, using Litmus or Phenophthalien for an indicator; make corrections and titrate again until one cc. of this solution is equivalent to one cc. of Sulphuric Acid. Add to 100 cc. of this solution 900 cc. of distilled water and one cc. of this N/10 solution will neutralize one cc. of N/10 Sulphuric Acid solution.

DETERMINATION OF SULPHUR IN H_2SO_4

Place in weighed platinum dish two grains, approximately, or recently heated Sodium Carbonate. Dissolve with a small amount of distilled water, cover and carefully add 25 cc. of Sulphuric Acid to be tested.

Evaporate to dryness on water bath. Remove cover and dry at 180° in air bath to constant weight.

In this process $SO_4 = 96$ has displaced $CO_3 = 60$; the difference in weight of platinum dish and contents before and after adding Sulphuric Acid is proportionate to amount of H_2SO_4 in the 25 cc. Then (96—60) : 98 :: difference in weight : x (H_2SO_4 in 25 cc.). $x \div 25 = .049$.

DETERMINATION OF OTHER CONTENTS OF ORE WHICH WILL DECOMPOSE CYANIDE

Place 500 grams of the ore in a percolator and add 1000 cc. of 10 pounds solution, allowing it to stand for 12 or 16 hours, and then drain slowly. Titrate the drained solution to determine Cyanide contents and note loss in strength.

Make another test with a sample to which lime has been added, as determined by acid test. Note the difference between the two tests, which will represent the loss due to the presence of other decomposing contents of the ore than the acid.

If this loss is heavy, a determination must be made to ascertain the cause.

TO DETERMINE ALKALINITY OF CYANIDE SOLUTION

Take 10 cc. of solution in a small beaker, and titrate it with Silver Nitrate for Cyanide. Add as much more Silver Nitrate as used in the titration, then add an excess of Potassium Ferro-Cyanide; add a drop or two of Phenophthalien and titrate with N/10 Sulphuric Acid solution.

If the solution contains much zinc, it will be necessary to filter before titrating.

The Burett reading multiplied by .0112 will give the percentage of protective alkaline of the Cyanide solution, which should be about 2%.

CYANIDE—Continued

AMOUNT OF GOLD AND SILVER IN CYANIDE SOLUTION

ALFRED CHIDDY'S METHOD

Add to four assay tons (or more) of the solution 10 cc. of 10% solution of lead acetate; then 4 grams zinc shavings; boil a minute; and 20 cc. HCl (strong). When action has ceased, boil again and decant from the ball of spongy lead, which has been decanted a little with a glass rod, and wash same by decantation. Transfer to a piece of filter paper, roll into a compact ball and place (without drying) on a hot cupel in the muffle.

It is best to transfer the compact ball from the filter paper to a piece of c.p. lead foil and then cupel directly or scorify first, then cupel.

Do not add all of the 20 cc. HCl at once, as zinc may break up on account of violent action.

ANOTHER METHOD

Take a piece of c.p. lead foil and form a tray about 5 inches long, 2½ inches wide and ¾ inches deep, and evaporate in this tray from one to three assay tons of the solution until dry, and then cupel the lead.

It is seldom necessary to scorify the lead before cupelling, unless the solution is very foul.

TABLES OF CYANIDE SOLUTIONS

1 lb. Cyanide to 1 ton water	0.05% solution
2 lb. Cyanide to 1 ton water	0.10% solution
3 lb. Cyanide to 1 ton water	0.15% solution
4 lb. Cyanide to 1 ton water	0.20% solution
5 lb. Cyanide to 1 ton water	0.25% solution
6 lb. Cyanide to 1 ton water	0.30% solution
7 lb. Cyanide to 1 ton water	0.35% solution
8 lb. Cyanide to 1 ton water	0.40% solution
9 lb. Cyanide to 1 ton water	0.45% solution
10 lb. Cyanide to 1 ton water	0.50% solution
.5 grammes Cyanide added to 1,000 cc. water	0.05% solution
1.0 grammes Cyanide added to 1,000 cc. water	0.10% solution
1.5 grammes Cyanide added to 1,000 cc. water	0.15% solution
2.0 grammes Cyanide added to 1,000 cc. water	0.20% solution
2.5 grammes Cyanide added to 1,000 cc. water	0.25% solution
3.0 grammes Cyanide added to 1,000 cc. water	0.30% solution
3.5 grammes Cyanide added to 1,000 cc. water	0.35% solution
4.0 grammes Cyanide added to 1,000 cc. water	0.40% solution
4.5 grammes Cyanide added to 1,000 cc. water	0.45% solution
5.0 grammes Cyanide added to 1,000 cc. water	0.50% solution

CYANIDE—Concluded

REFERENCE TABLES

GRAMME TABLE, FOR THE ASSAY OF CYANIDE SOLUTIONS

If ½ Pint of Solution Gives of Fine Metal	One Ton of Solution will Give Fine Metal			If ½ Pint of Solution Gives of Fine Metal	One Ton of Solution will Give Fine Metal		
Gramme	Ozs.	Pwts.	Grs.	Gramme	Ozs.	Pwts.	Grs.
.0001	0	0	5.5	.0200	2	5	20
.0002	0	0	11	.0300	3	8	18
.0003	0	0	16.5	.0400	4	11	16
.0004	0	0	22	.0500	5	14	14
.0005	0	1	3.5	.0600	6	17	12
.0006	0	1	9	.0700	8	0	10
.0007	0	1	14.5	.0800	9	3	8
.0008	0	1	20	.0900	10	6	6
.0009	0	2	1.5	.1000	11	9	4
.0010	0	2	7	.2000	22	18	8
.0020	0	4	14	.3000	34	7	12
.0030	0	6	21	.4000	45	16	16
.0040	0	9	4	.5000	57	5	20
.0050	0	11	11	.6000	68	15	0
.0060	0	13	18	.7000	80	4	4
.0070	0	16	1	.8000	91	13	8
.0080	0	18	8	.9000	103	2	12
.0090	1	0	15	1.0000	114	11	16
.0100	1	2	22	2.0000	229	3	8

GRAIN TABLE, FOR THE ASSAY OF CYANIDE SOLUTIONS

If ½ Pint of Solution Gives of Fine Metal	One Ton of Solution will Give Fine Metal			If ½ Pint of Solution Gives of Fine Metal	One Ton of Solution will Give Fine Metal		
Grains	Ozs.	Pwts.	Grs.	Grains	Ozs.	Pwts.	Grs.
.001	0	0	3.5	.060	0	8	23
.002	0	0	7	.070	0	10	11
.003	0	0	11	.080	0	11	23
.004	0	0	14.5	.090	0	13	10
.005	0	0	18	.100	0	14	22
.006	0	0	21.5	.200	1	9	20
.007	0	1	1	.300	2	4	19
.008	0	1	4.5	.400	2	19	16
.009	0	1	8	.500	3	14	14
.010	0	1	12	.600	4	9	12
.020	0	3	0	.700	5	4	10
.030	0	4	12	.800	5	19	8
.040	0	6	0	.900	6	14	6
.050	0	7	11	1.000	7	9	4

STANDARD SOLUTIONS

An Empirical solution is a standard solution, 1 cc. of which contains sufficient of the active reagent to neutralize 1% of the substance to be estimated. when ½ or 1 gramme of sample is weighed out.

A Normal solution is a standard solution containing in one litre the Hydrogen Equivalent in grammes of the active reagent.

By Hydrogen equivalent in the case of acids and alkalies is meant the acidity or basicity of the substance, as:

Hydrogen Equivalent of H Cl, $36.4 \div 1 = 36.4$
Hydrogen Equivalent of H_2SO_4, $98.0 \div 2 = 49.0$
Hydrogen Equivalent of NaOH, $40.0 \div 1 = 40.0$

In case of a precipitation the Hydrogen Equivalent would be the valence of the atom precipitated.

In case of the oxidation or reduction, ascertain the atoms of oxygen absorbed or given off by molecule of the active reagent.

Indicators used are Litmus, Methyl Orange, Cochineal and Phenolphthalein. Methyl Orange cannot be used in the presence of vegetable salts and acids. Cochineal cannot be used in the presence of iron salts. Phenolphthalein cannot be used in the presence of NH_3, CO_2 and H_2S.

STANDARD NORMAL SULPHURIC ACID SOLUTION

Hydrogen Equivalent of H_2SO_4, $= 98 \div 2 = 49$.

Weigh out about 50 grammes of H_2SO_4 Sp. Gr. 1.84 and dilute to one litre. Determine the exact amount of H_2SO_4 in this solution by precipitation with Ba Cla_2. From this result figure the exact amount of H_2SO_4 in 1 cc. of solution. The reason 50 grammes are weighed out instead of 49 grammes, the calculated amount, is that C. P. sulphuric acid contains about 97.5% H_2SO_4 (the balance being water).

The amount of H_2SO_4 in one cc. of a normal solution is 0.049 grammes. Suppose it is found that one cc. of acid solution contains 0.0539 grammes of sulphuric acid instead of 0.049, showing it to be too strong, therefore to make it just normal it must be diluted.

$$0.049 : 0.539 :: 1000 \text{ cc.} \left\{ \begin{array}{l} \text{cc's taken out to} \\ \text{determine } H_2SO_4 \end{array} \right\} : x \left\{ \begin{array}{l} \text{No. cc's solution} \\ \text{should contain.} \end{array} \right\}$$

Therefore dilute solution to the number cc's it is found that it should contain.

STANDARD NORMAL SODIUM HYDRATE SOLUTION

Hydrogen Equivalent of NaOH, $= 40 \div 1 = 40$.

Weigh out 42 grammes NaOH, dilute to 1 litre. Take an exact number of cc's of this solution, place in a flask, dilute to 150 cc. and add a few drops of Methyl Orange as indicator. Titrate this with standard sulphuric acid. This will give the exact weight of NaOH in sample taken.

49:40::Wt. of sulphuric acid neutralized: Wt. of sodium hydrate neutralized. Divide this result by the number of cc's taken gives weight of NaOH in each cc. of standard solution.

Figure the volume of exact normal solution as above in sulphuric acid. Accurate adjustment to make the solution just normal in this manner is difficult and in most cases it is better to determine factor by which readings must be multiplied in order to correct the difference between the real strength of solution and normal strength.

$$\frac{\text{Actual strength}}{\text{Normal strength}} = \text{factor.}$$

STANDARD SOLUTIONS

STANDARD DECINORMAL $KMnO_4$ SOLUTION

To make a solution of $KMnO_4$ such that 1 cc. shall equal 0.0056 grammes of iron.

$2\ KMnO_4 + 10\ FeSO_4 + 8\ H_2SO_4 = K_2SO_4 + 5\ Fe_2\ (SO_4)_3 + 2\ Mn\ SO_4 + 8\ H_2O.$

$2\ KMnO_4 = K_2O + Mn_2O_7$

$Mn_2O_4 = 2\ MnO + 5\text{–}O.$

One atom of oxygen will oxidize 2 atoms of iron, therefore $KMnO_4$ will oxidize 5 atoms of iron.

Molec. Wt. of $KMnO_4 = 158 \div 5 = 31.6$.

A decinormal solution will be 31.6 grammes $\div 10 = 3.16$ grammes.

Therefore weigh out 3.16 grammes $KMnO_4$.

Make an empirical solution of $KMnO_4$ such that 1 cc. of solution will equal 1% of iron when one gramme is weighed out.

From the above equations:

31.6 grammes $KMnO_4$ in one litre of solution 1 cc. of which $= 0.056$ grammes iron.

To make 1% solution 1 cc. will have to equal 0.01 gramme Fe.

Therefore $3.16 : 0.056 :: x : 0.01$.

$$\frac{31.6 \times 0.01}{0.056} = 5.64 \text{ grammes } KMnO_4.$$

5.64 grammes $KMnO_4$ are required to make 1 litre of solution equal to 1% of iron for 1 gramme sample weighed out. Standardize the above solution with a known iron solution. Dissolve .25 grammes of clean piano wire, which contains 99.7% iron, in dilute hot sulphuric acid in a flask, being careful to exclude air from the flask as much as possible. Expel air from flask by adding a small quantity of sodium carbonate. When all iron is dissolved and hydrogen boiled off, dilute to about 150 cc's and titrate with $KMnO_4$ solution.

STANDARD DECINORMAL $K_2Cr_2O_7$ SOLUTION

Make a solution of $K_2Cr_2O_7$ such that 1 cc. $= 0.0056$ grammes Fe.

$K_2Cr_2O_7 + 6\ FeCl_2 + 14\ HCl = 2\ KCl + Cr_2Cl_6 + 7\ H_2O + 3\ Fe_2Cl_6.$

$K_2Cr_2O_7 = K_2O + 2\ CrO_3 \div 2CrO_3 = Cr_2O_3 + 3\text{–}O.$

Three atoms of oxygen will oxidize 6 atoms of iron.

Molec. Wt. of $K_2Cr_2O_7 = 296.56 \div 6 = 49.4$ grammes.

Weigh out one-tenth of 49.4 grammes = 4.94 grammes for decinormal solution equal 0.0056 grammes iron.

Make empirical solution, such that 1 cc. will equal 1% of iron when 1 gramme of sample is taken.

Therefore as above for permanganate solution, we have:

$49.4 : 0.056 :: x : 0.01$

$$\frac{49.4 \times 0.01}{0.056} = 8.82 \text{ grammes } K_2Cr_2O_7 \text{ required to make 1 litre of solution of above strength.}$$

To standardize these solutions dissolve .25 grammes of clean piano wire in hydroclhoric acid. Treat this the same as in method for the determination of iron by $K_2Cr_2O_7$ solution given under the head "Rapid Assay Methods."

As before stated it is difficult to obtain an accurate normal or empirical solution, therefore it is best in most cases to determine factor. This is figured the same as under Standard Sodic Hydrate solution. The Permanganate solution cannot be used in the presence of hydrochloric acid, arsenic or antimony.

The Bichromate solution is equally effective in both sulphuric and hydrochloric acids:

Courtesy of Western Chemical Mfg. Co.

QUALITATIVE TESTS FOR IMPURITIES IN AQUA AMMONIA

SULPHATES.—Dilute the aqua ammonia with distilled water, acidify the solution with strictly chemically pure hydrochloric acid and add a few drops of a solution of barium chloride. If a white precipitate forms, sulphates are present.

CHLORIDES.—Dilute the ammonia with distilled water, acidify with chemically pure nitric acid and add a few drops of silver nitrate solution. A white precipitate, which redissolves upon the addition of more ammonia, indicates the presence of chlorides.

CARBONATES.—Dilute with distilled water, add clear lime water and allow to stand a few minutes. A white precipitate indicates the presence of carbonates.

ORGANIC MATTER.—Dilute 10 cc. of aqua ammonia with 10 cc. of distilled water, add 20 cc. of C. P. nitric acid (Sp. Gr. 1.42) very slowly so as to avoid raising the temperature appreciably. A distinct organic odor and a very slight reddish color should develop if organic matter be present.

SOLUBILITY OF METALS IN AQUA AMMONIA,

in the order of their solubility:

Copper — quite soluble.
Zinc,
Nickel,
Cobalt,
Lead,
Iron — Very slightly soluble, if at all.
Aluminum — Very slightly soluble, if at all.
Magnesium — Very slightly soluble, if at all.

IMPURITIES IN C. P. ACIDS

And Tests for Same

HYDROCHLORIC ACID.

For Iron.—Dilute, and add KSCN; if it shows a red color there is iron present.

For Arsenic.—Dilute, pass in hydrogen sulphide gas; if a distinct yellow precipitate is obtained it would indicate traces of arsenic; also try by the Marsh test.

For Sulphuric Acid.—Dilute, add barium chloride; a white precipitate would be obtained if sulphuric acid were present.

NITRIC ACID.

For Chlorine.—Add silver nitrate, if slight opalescence occurs, it shows presence of chlorine.

SULPHURIC ACID.

For Arsenic.—Dilute and pass in hydrogen sulphide gas; if a distinct yellow precipitate is the result it shows the presence of arsenic; also try by the Marsh test.

For Iron.—Dilute, add KSCN; if red color appears it shows presence of iron.

In making these tests extreme care should be taken that all of the glassware and apparatus used in the tests are absolutely free from the impurity tested for; also make tests on the distilled water to be used in the examination, so as to be sure the water is perfectly pure.

Always pour acid into water, and not water into acid, to avoid explosions.

Never grind potassium chlorate and sulphur together. It is very explosive.

Formula for Blue Prints:

Potassium ferricyanide	150 grms.
Ammonia, citrate of iron	150 grms.
Water	600 cc.

Dissolve each of the salts in half the water, mix and coat one side of the paper, dry in dark room. Expose to light and develop by floating in water.

Courtesy of Western Chemical Mfg. Co.

TABLE OF SOLUBILITIES

IN WATER, ALCOHOL, ETHER, CHLOROFORM AND GLYCERINE, OR MEDICINAL SUBSTANCES, INCLUDING MANY OTHERS OF COMMON OR FREQUENT USE

Abbreviations: S., Soluble; V. S., Very Soluble; Sp., Sparingly; A., All Proportions; Sl., Slightly; Ins., Insoluble; N. Ins., Nearly Insoluble; Dec., Decomposed.

Chemical Substances One Part is Soluble in (at 59° F.) (15° C.) Standard Temperature	Parts of				
	Water	Alcohol	Ether	Chloroform	Glycerine
Acetanilide	194	4	V. S.	V. S.	.....
Acid, Arcenic	2	.....	.....	.....	5
Arsenous	100	141	.....	.....	5
Benzoic	400	2	2.5	7	5
Boric	25.6	15	.....	.....	5
Citric	0.75	1.61	50	N. Ins.	2
Formic	V. S.	V. S.	3	.....	S.
Gallic	100	5	40	.....	12
Lactic	A.	A.	A.	Ins.	.....
Oleic	Ins.	A.	A.	A.	.....
Oxalic	3	2.5	N. Ins.	Ins.	7.5
Phosphoric, Glacial	V. S.	V. S.	Ins.	.....	.....
Picric	86	S.	S.	S.	.....
Pyrogallic (see Pyrogallo)	.....	.....	.....	.....	.....
Salicylic	450	2.4	2	80	20
Steric	Ins.	45	9	S.	.....
Succinic	19	8	79	N. Ins.	.....
Tannic	1	0.6	N. Ins.	N. Ins.	1
Tartaric	0.8	2.5	250	N. Ins.	A.
Trichloracetic	S.	S.	S.	Dec.	Dec.
Alcohol	A.	.....	A.	A.	A.
Amylic	Sp.	A.	A.	.....	.....
Methylic	A.	A.	A.	.....	.....
Alum	8	Ins.	Ins.	Ins.	2.5
Aluminum Hydrate	Ins.	Ins.	Ins.	Ins.	Ins.
Sulphate	1.2	Ins.	Ins.	Ins.	Ins.
Ammonium Benzoate	5	28	Ins.	Ins.	8
Bicarobnate	8	Ins.	.....	.....	.....
Borate	12	.....	.....	.....	.....
Bromide	1.5	25	600	.....	.....
Carbonate	5	Dec.	Ins.	.....	5
Chloride	3	Sp. Sol.	Ins.	.....	5
Iodide	1	9	Ins.	.....	.....
Nitrate	0.5	20	.....	.....	.....
Oxalate	234	.....	.....	.....	.....
Phosphate	4	Ins.	.....	.....	.....
Sulphate	1.2	Sp.	.....	.....	.....
Amyl Acetate	Ins.	A.	A.	.....	.....
Nitrate	Ins.	A.	A.	A.	.....
Anilin	33	A.	A.	A.	.....
Antifebrin (see Acetanilid)	.....	.....	.....	.....	.....
Antimony Arsenate	Ins.	Ins.	.....	.....	.....
Oxide	Sp.	Ins.	Ins.	Ins.	.....
Sulphide	Ins.	Ins.	.....	.....	.....

TABLE OF SOLUBILITIES
CONTINUED

Chemical Substances One Part is Soluble in (at 59° F.) (15° C.) Standard Temperature	Parts of				
	Water	Alcohol	Ether	Chloroform	Glycerine
Antimony and Potassium Tartrate	17	Ins.	Ins.	20	20
Arsenic Bromide	Dec.	.....	.....	.....	.....
Iodide	7	30	Sol.	.....	.....
Trioxide	90	145	.....	.....	.....
Barium Acetate	1	100	.....	.....	.....
Bromide	V. S.	S.	.....	.....	.....
Carbonate	Ins.	N. Ins.	.....	.....	.....
Chloride	2½	Ins.	.....	.....	10
Nitrate	8-12	Ins.	.....	.....	.....
Benzene	Ins.	.....	S.	S.	.....
Bismuth Chloride	Ins.	Ins.	.....	.....	.....
Citrate	Ins.	Ins.	.....	.....	.....
Oxide	Ins.	Ins.	.....	.....	.....
Oxyiodide	Ins.	Ins.	.....	.....	.....
Subcarbonate	Ins.	Ins.	Ins.	.....	.....
Subgallate	Ins.	Ins.	Ins.	.....	.....
Subnitrate	Ins.	Ins.	.....	.....	.....
Tannate	Ins.	Ins.	.....	.....	.....
And Ammonium Citrate	V. S.	Sp.	.....	.....	.....
Bromine	30	S. (Dec.)	S. (Dec.)	S.	.....
Brucine	750	2	Ins.	.....	50
Cadmium Acetate	V. S.	.....	.....	.....	.....
Chloride	0.7	S.	.....	.....	.....
Iodide	2	Sol.	.....	.....	.....
Salicylate	68	S.	5	Ins.	S.
Sulphate	V. S.	V. S.	.....	.....	.....
Calcium Acetate	S.	S.	.....	.....	.....
Benzoate	18	.....	.....	.....	.....
Bromide	0.7	1	.....	.....	.....
Carbonate	Ins.	Ins.	Ins.	Ins.	.....
Chloride	1½	8	Ins.	Ins.	.....
Hypophosphite	6.8	Ins.	.....	.....	.....
Hyposulphite	1	.....	.....	.....	.....
Iodide	½	S.	.....	.....	.....
Phosphate	Ins.	Ins.	Ins.	.....	.....
Sulphate, dried	390	Ins.	.....	.....	.....
Sulphite	800	.....	.....	.....	20
Camphor	Sp.	V. S.	V. S.	V. S.	.....
Canada Balsam	Ins.	2.33	S.	S.	.....
Carbon Disulphide	535	V. S.	V. S.	V. S.	.....
Cerium Acetate	V. S.	S.	.....	.....	.....
Bromide	Sl.	S.	.....	.....	.....
Nitrate	S.	S.	.....	.....	.....
Oxalate	Ins.	Ins.	Ins.	.....	.....
Chloroform	200	A.	A.	.....	.....
Chromium Trioxide	V. S.	Dec.	Dec.	Ins.	Dec.
Copper Acetate	15	16	Ins.	.....	10
Ammoniate	1½	Ins.	.....	.....	.....

TABLE OF SOLUBILITIES

CONTINUED

Chemical Substances One Part is Soluble in (at 59° F.) (15° C.) Standard Temperature	Parts of				
	Water	Alcohol	Ether	Chloroform	Glycerine
Copper Chloride	V. S.	V. S.	.....	.....	.....
Nitrate	S.	S.	.....	.....	.....
Solphate	2.6	500	Ins.	.....	3½
Creosote	150	S.	A.	A.	.....
Cresol	65	S.	S.	.....	S.
Ether Acetic	9	A.	A.	.....	.....
Sulphuric	12	A.	.....	A.	.....
Ethyl Bromide	Sp.	A.	A.	S.	.....
Iodide	N. Ins.	V. S.	V. S.	.....	.....
Glycerine	A.	A.	Ins.	Ins.	.....
Gold Bromide (Mono.)	Ins.	.....	.....	.....	.....
(Tri.)	S.	S.	S.	.....	.....
Chloride (Tri.)	S.	S.	S.	.....	.....
Iodide	Ins.	Ins.	.....	.....	.....
And Sodium Chloride	2	S.	.....	.....	.....
Gutta Percha	Ins.	Ins.	.....	S.	.....
Ichthyol	S.	Sp.	Sp.	S.	S.
Iron Acetate	4	S.	.....	.....	.....
Albuminate	S.	Ins.	.....	.....	.....
Arsenate	Ins.	Ins.	.....	.....	.....
Bromide	S.	S.	.....	.....	.....
Carbonate Saccharated	Sp.	Ins.	.....	.....	.....
Chloride (Ferric)	V. S.	V. S.	Sl.	.....	.....
Citrate	S.	Ins.	Ins.	.....	.....
Hypophosphite	N. Ins.	.....	.....	.....	.....
Iodide	S.	.....	.....	.....	S.
Iodide, Saccharated	7	N. Ins.	.....	.....	.....
Nitrate	S.	S.	.....	.....	.....
Oxalate	N. Ins.	Ins.	.....	.....	.....
Phosphate (Soluble)	V. S.	Ins.	.....	.....	.....
Pyrophosphate	V. S.	Ins.	.....	.....	.....
Sulphate	1	Ins.	Ins.	.....	4
And Amonium Chloride	S.	Ins.	.....	.....	.....
Ammonium Citrate	S.	Ins.	.....	.....	.....
Ammonium Sulphate	3	Ins.	.....	.....	.....
Ammonium Tartrate	V. S.	Ins.	.....	.....	13
Potassium Tartrate	V. S.	Ins.	.....	.....	.....
Lead Acetate	2.3	30	Ins.	3	5
Carbonate	Ins.	Ins.	.....	.....	.....
Chloride	140	200	.....	.....	.....
Chromate	Ins.	.....	.....	.....	.....
Iodide	2000	Sp.	N. Ins.	.....	.....
Nitrate	2	N. Ins.	.....	.....	.....
Oxide	N. Ins.	Ins.	.....	.....	.....
Sulphate	N. Ins.	Ins.	.....	.....	.....
Lithium Benzoate	3	13	.....	.....	.....
Bromide	0.6	V. S.	S.	.....	.....
Carbonate	80	Ins.	Ins.	.....	.....

TABLE OF SOLUBILITIES

CONTINUED

Chemical Substances One Part is Soluble in (at 59° F.) (15° C.) Standard Temperature	Parts of				
	Water	Alcohol	Ether	Chloroform	Glycerine
Lithium Chloride	1.7	V. S.	.....	.....	.....
Citrate	2	N. Ins.	Ins.	.....	S.
Iodide	0.6	.....	.....	.....	.....
Nitrate	2	.....	.....	.....	.....
Magnesia	N. In.	Ins.	.....	.....	.....
Magnesium Acetate	S.	S.	.....	.....	.....
Benzoate	V. S	.....	.....	.....	.....
Bromide	V. S.	S.	.....	.....	.....
Carbonate	N. Ins.	Ins.	.....	.....	.....
Chloride	0.6	.....	.....	.....	.....
Phosphate	350	Ins.	.....	.....	.....
Sulphate	1	Ins.	Ins.	.....	.....
Sulphite	40	Ins.	Ins.	.....	.....
Tartrate	122	.....	.....	.....	.....
Manganese	20	Sp.	.....	.....	.....
Carbonate	Ins.	Ins.	.....	.....	.....
Chloride	2½	S.	Ins.	.....	.....
Dioxide	Ins.	Ins.	Ins.	.....	.....
Hypophosphite	V. S.	.....	.....	.....	.....
Iodide	S.	.....	.....	.....	.....
Phosphate	Ins.	Ins.	.....	.....	.....
Sulphate	0.8	Ins.	Ins.	.....	.....
Menthol	Sl.	V. S.	V. S.	V. S.	.....
Mercury Bisulphate	333	Ins.	Ins.	.....	.....
Chloride	Ins.	Ins.	.....	.....	.....
Corrosive	16	3	4	.....	2
Mild	Ins.	Ins.	Ins.	.....	.....
Cyanide	12.8	15	Sp.	.....	4
Iodide, Yellow	N. Ins.	Ins.	Ins.	.....	.....
Red	N. Ins.	130	Ins.	S.	3½
Oxide Yellow	Ins.	Ins.	.....	.....	.....
Red	Ins.	Ins.	.....	.....	.....
Sulphate, Basic	2000	Ins.	.....	.....	.....
Sulphide, Black	Ins.	.....	.....	.....	.....
Red	Ins.	Ins.	.....	.....	.....
Naphthalin	Ins.	15	V. S.	V. S.	.....
Naphthol (Alpha)	S.	V. S.	V. S.	.....	.....
(Beta)	1000	0.75	V. S.	V. S.	.....
Nickel Acetate	6	Ins.	.....	.....	.....
Bromide	S.	S.	S.	.....	.....
Nitrate	2	S.	.....	.....	.....
Phosphate	Ins.	.....	.....	.....	.....
Sulphate	4	Ins.	Ins.	.....	.....
Nitroglycerine	N. Ins.	V. S.	S.	.....	.....
Paraffine	Ins.	Ins.	S.	S.	.....
Phenyl Hydrazine	Sp.	V. S.	V. S.	.....	.....
Phosphorus	Ins.	S.	80	V. S.	500
Potassa, Sulphurated	2	Sp.	.....	.....	.....

TABLE OF SOLUBILITIES

CONTINUED

Chemical Substances One Part is Soluble in (at 59° F.) (15° C.) Standard Temperature	Parts of				
	Water	Alcohol	Ether	Chloroform	Glycerine
Potassium Acetate	0.36	1.9	Ins.	------	------
Arsenate	V. S.	25	------	------	2
Arsenite	V. S.	Sp.	------	------	------
Benzoate	V. S.	------	------	------	------
Bicarbonate	3.2	N. Ins.	Ins.	------	------
Bichromate	10	Ins.	Ins.	------	------
Bisulphate	2	Ins.	------	------	------
Bisulphite	V. S.	------	------	------	------
Bitartrite	201	Sp.	Ins.	------	------
Bromide	1.6	200	Ins.	------	4
Carbonate	1.1	Ins.	Ins.	------	------
Chlorate	16.7	Sp.	Ins.	------	30
Chloride	3	S.	Ins.	------	30
Citrate	0.6	Sp.	------	------	------
Cyanide	2	Sp.	Sp.	------	3.5
Ferricyanide	4	Sp.	------	------	------
Ferrocyanide	4	Ins.	------	------	------
Hydrate	0.5	2	Sl.	------	------
Hypophosphite	0.6	7.3	Ins.	------	------
Iodide	0.75	18	Ins.	------	3
Nitrate	3.8	Sp.	Ins.	------	------
Nitrite	V. S.	------	------	------	------
Oxalate	S.	------	------	------	------
Permanganate	16	Dec.	Ins.	------	Dec.
Phosphate	S.	------	------	------	------
Sulphate	9.5	Ins.	Ins.	------	------
Tartrate	1	Ins.	Ins.	------	------
And Sodium Tartrate	1.4	N. Ins.	Ins.	------	------
Pyridine	A.	V. S.	V. S.	------	------
Pyrogallol	17	1	1.2	------	------
Resin	Ins.	S.	S.	S.	------
Resorcin	0.6	0.5	V. S.	Sl.	V. S.
Saccharin	230	30	0.3	------	S.
Silver Acetate	100	Sp.	------	------	------
Bromide	Ins.	------	------	------	------
Chloride	Ins.	------	------	------	------
Cyanide	Ins.	Ins.	------	------	------
Iodide	Ins.	Ins.	------	------	------
Nitrate	0.6	26	------	------	------
Oxide	N. Ins.	Ins.	------	------	------
Sulphate	200	------	------	------	------
Sodium Acetate	1.4	30	Ins.	------	------
Arsenate	4	Sp.	------	------	2
Arsenite	S.	Sp.	------	------	------
Benzoate	1.8	45	Ins.	------	------
Bicarbonate	14	Ins.	Ins.	------	13
Bisulphite	4	72	------	------	------
Borate	16	Ins.	Ins.	------	2

TABLE OF SOLUBILITIES
CONCLUDED

Chemical Substances One Part is Soluble in (at 59° F.) (15° C.) Standard Temperature	Parts of				
	Water	Alcohol	Ether	Chloroform	Glycerine
Sodium Bromide	1.2	13	Ins.	.....	.....
Carbonate	1.6	Ins.	Ins.	.....	1.02
Chlorate	1.1	100	.....	.....	5
Chloride	2.8	N. Ins.	Ins.	Ins.	5
Citrate	V. S.	.....	.....	.....	.....
Formate	S.	.....	.....	.....	S.
Hydrate	1.7	V. S.	.....	.....	.....
Hypophosphite	1	30	Ins.	.....	.....
Iodide	0.6	3	Ins.	.....	.....
Nitrate	1.3	100	Ins.	.....	.....
Nitrite	1.5	Sl.	.....	.....	.....
Phosphate	5.8	Ins.	Ins.	.....	.....
Pyrophosphate	12	Ins.	.....	.....	.....
Sulphate	2.3	Ins.	Ins.	.....	S.
Sulphide	V. S.	Sl.	.....	.....	.....
Sulphite	4	Sp.	.....	.....	.....
Tartrate	5	Ins.	.....	.....	.....
Thiosulphate	0.65	Ins.	.....	.....	.....
Strontium Bromide	1.05	S.	Ins.	.....	.....
Carbonate	Sl.	.....	.....	.....	.....
Chloride	2	20	.....	.....	.....
Iodide	0.6	S.	Sl.	.....	.....
Nitrate	5	Ins.	.....	.....	.....
Sulphate	Sl.	Ins.	.....	.....	.....
Sugar, Cane	0.5	175	Ins.	Ins.	S.
Milk	6	Ins.	Ins.	Ins.	.....
Sulphur Iodide	Ins.	Dec.	Dec.	.....	60
Precipitated	Ins.	Ins.	S.	S.	.....
Sublimed	Ins.	Ins.	S.	S.	.....
Washed	Ins.	Ins.	S.	S.	.....
Uranium Acetate	10	Sl.	.....	.....	.....
Chloride	S.	.....	.....	.....	.....
Nitrate	V. S.	V. S.	4	.....	.....
Urea	1	Ins.	Ins.	.....	2
Wax, Yellow	Ins.	Sp.	V. S.	V. S.	.....
Zinc Acetate	2.7	36	Ins.	.....	.....
Bromide	V. S.	V. S.	.....	.....	.....
Carbonate, Precip	Ins.	Ins.	.....	.....	.....
Chloride	0.3	V. S.	S.	.....	2
Cyanide	Ins.	Ins.	.....	.....	.....
Iodide	V. S.	V. S.	V. S.	.....	2.5
Nitrate	V. S.	S.	.....	.....	.....
Oxide	Ins.	Ins.	.....	.....	.....
Permanganate	V. S.	V. S.	.....	.....	Explodes
Phosphate	Ins.	Ins.	.....	.....	.....
Phosphide	Ins.	Ins.	.....	.....	.....
Sulphate	0.6	Ins.	Ins.	.....	3
Tannate	Ins.	Ins.	.....	.....	Ins.

Taken from The Era Dose Book

MASSCO
SERVICE
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